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Fig. 2. Dog's thyroid. Section made at point of injection showing complete destruction of gland-cells, partial destruction of colloid with filling of acini with red blood-cells. (Miles F. Porter.)

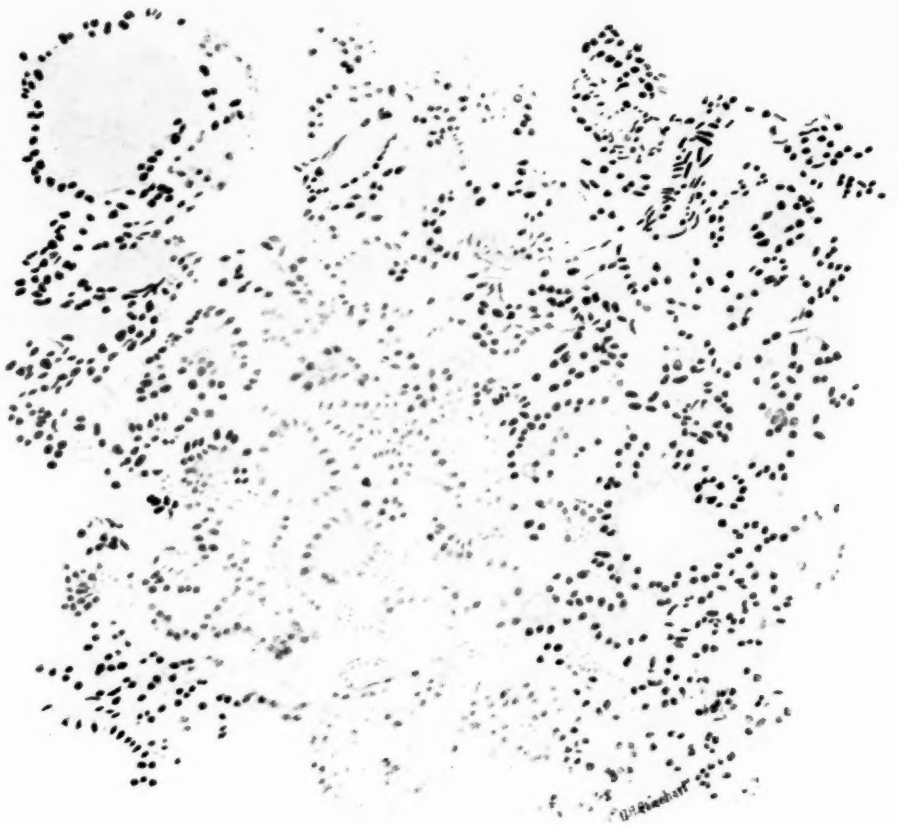

Fig. 1. Dog No. 1. Section of thyroid removed immediately after hot water injection, showing extensive destruction of the thyroid tissue. In places the epithelial cells are entirely destroyed, leaving nothing but a connective-tissue network. The colloid has been in large part dissolved and where not completely dissolved, it has been so altered that it no longer takes the eosin stain well. This figure and Figs. 2 and 3 were drawn with camera lucida, Leitz obj. 6, oc. 3.

SURGERY, GYNECOLOGY AND OBSTETRICS

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BOILING WATER INJECTIONS INTO THE THYROID GLAND FOR HYPERTHYROIDISM[1]

BY MILES F. PORTER, A.M., M.D., F.A.C.S., FORT WAYNE, INDIANA

Surgeon to Hope Hospital; Professor of Surgery in the Indiana University School of Medicine

IN previously published papers[2 and 3] I have given in detail the history of the development of this method of treating hyperthyroidism, including the experimental and clinical data up to the time of publication of those papers. My purpose in the present paper is to review in abstract the experimental work, to bring the clinical experience up to date as nearly as possible, and, on this basis, to arrive at a reliable estimate as to the value of the method, its indications and limitations, and to give the technique of the procedure.

Animal experiments. These were performed on dogs by my assistants, Drs. Beall and Mouser, and by Dr. W. D. Gatch of the Indiana University School of Medicine. The experiments consisted of injections of boiling water into the thyroid subcutaneously and through an incision, followed by examination as to the immediate and remote effects of the procedure. These experiments demonstrated (1) the safety of the procedure, (2) that the immediate effect of the injection of the boiling water was a destruction of the gland-cells and colloid which is later replaced by connective tissue, (3) that a goiter in the dog can, by this means, be cured permanently.[4]

Figures 1 and 2 show the immediate effect of injection of hot water in a dog's thyroid. These illustrations were made from sections taken from the tissue at the site of the injection. Figure 3 shows a section made from a point somewhat removed from the point of injection. Figure 4 is a picture made from a specimen taken eight weeks after the injection and shows a great amount of fibrosis.

Experiments on human goiters. These experiments were made in our own laboratory and that of Dr. Gatch. Like experiments have been done in the Mayo laboratory also, but I have no details of their findings. The experiments consisted of the injection of boiling water into freshly removed human goiters and immediate examination of microscopical sections. The findings were the same as in the thyroids of dogs; viz., destruction of cells and colloid (Fig. 5).

I also had sections made of a goiter which was removed after the hot-water treatment (four months after last injection and ten months after first). Figure 6 shows a picture made from this specimen and it will be noted that the findings are practically the same as those in the specimen (Fig. 4) taken from the dog eight weeks after the injection.

Clinical experience. This covers over one hundred cases, some of which were in my own practice, but the majority in the practice

[2] J. Am. M. Ass., 1911, lvii, 1120.

[3] J. Am. M. Ass., 1913, lxi, 88.

[4] Beall and Mouser (see Experiment, Dog 6). J. Am. M. Ass., 1913, lxi, 93.

[1] Read before The Chicago Surgical Society, November 6, 1914. (See discussion, p. 103.)

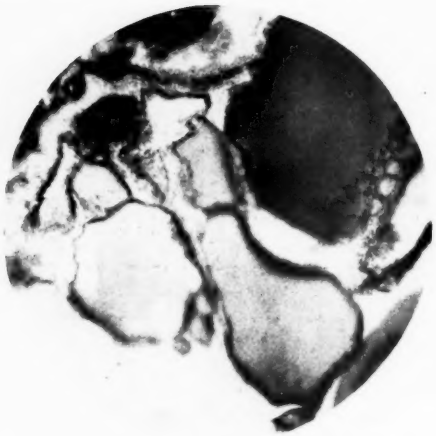

Fig. 5. Case of exophthalmic goiter in female, age 35. Thyroid was removed and soon thereafter the gland was injected with about 200 minims of boiling water. Microscopic examination of the part thus treated shows some necrosis of the epithelium here and there, with absence of the colloid substance in some of the alveoli and loss of its staining characteristics in others. Many of the alveoli are distended, and the interstitial connective tissue is slightly œdematous. (B. M. Edlavitch.)

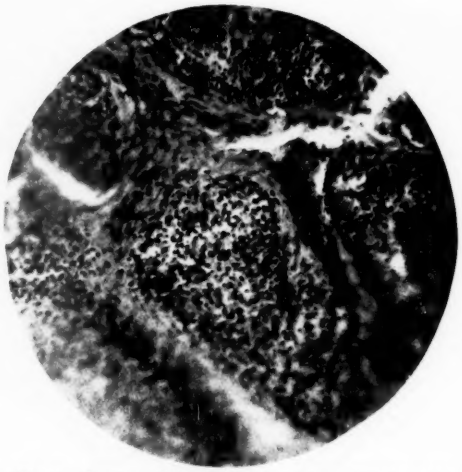

Fig. 6. Section of thyroid removed from female patient after treatment by injections of hot water. Sections made four months after last injection and ten months after first. The prevailing picture is one of connective-tissue hyperplasia. Note the thick strands of cicatricial connective tissue constricting and compressing the parenchyma, thereby completely obliterating the gland structure. x 265. (B. W. Rhamy.)

of other surgeons. I am especially indebted to Dr. Robert T. Morris of New York, Dr. W. Wayne Babcock of Philadelphia, and Dr. J. C. O'Day of Portland, Oregon, for their kindness in reporting to me the results of their work. There have been no deaths or serious results reported from the treatment.

Dr. Babcock reports[1] a fatality following the injection of hot water, as follows: "A patient who seemed in fair condition was brought to the operating room for ligation or lobectomy, when she became intensely excited and the pulse rate increased from about 130 to about 170. The patient was nearly maniacal from the excitement. The operation, therefore, was not attempted and one lobe was injected with boiling water and the patient returned to bed. Tachycardia and excitement continued and three or four days later the patient died."

Dr. Babcock further says: "During the past year we have prepared all patients with intense hyperthyroidism for operation by your method of injecting boiling water. It is my opinion that in this way one may accomplish as much in a week as by putting the patient to bed for six weeks to three months. In my opinion there is no question that the injection produces a more intense effect than a double ligation. The reason for this is obvious when one does a lobectomy a week or ten days after the injection and finds that there has been to a large degree arrest of circulation in half of the thyroid, with extensive necrosis. In a few instances no secondary operation was performed, yet there was marked relief from symptoms which had persisted until the present time. As a rule, however, we give the injection to prepare the patient for a lobectomy. At least one of our patients prepared for lobectomy by the injection had been refused operation in other clinics. I have given the injection a number of times in the office, and the patient has returned to her home immediately afterward without harm. The patients with more intense symptoms have all, of course, been in the hospital."

My own experience[2] is quite in accord with that of Dr. Babcock. Not infrequently

[1] Personal letter.

[2] J. Am. M. Ass., 1913, July 12.

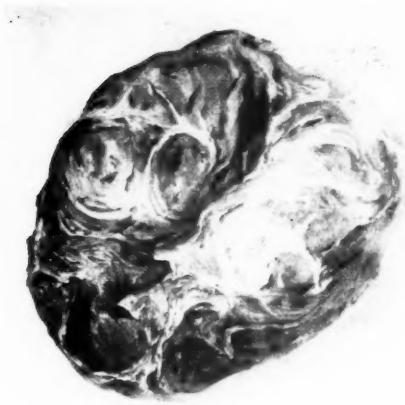

Fig. 7. Hyperplastic goiter with adenomatous enlargement. Moderate symptoms of hyperthyroidism.

patients who have had the injection treatment with a view to future thyroidectomy find themselves so much improved that they refuse further treatment, as in Case 18, reported in a former paper.

As to the relative efficiency of the boiling-water injection and ligation, there seems to be no longer any reason for doubt. I quite agree with Babcock that an injection will accomplish more than a double ligation, and also that one can accomplish as much by one injection as can be accomplished by six weeks' to three months' rest treatment.

C. H. Mayo[1] says: "Extreme conditions, especially dilatation of the heart, may require medical preparation, and the operative interference following in cases resistant to treatment should be confined to injection of boiling water into the gland after Porter's plan to hasten improvement."

The relief following the injection usually manifests itself within the first twenty-four or forty-eight hours, and some patients show decided improvement in the symptoms, tachycardia and tremor, immediately. This immediate improvement has been attributed to the psychic effect. Frequently the improvement progresses for a week or two. This is attributed to the strangulation of the cells and blood-vessels by the contraction of

[1] Collected Papers, 1913, p. 567.

Fig. 8. Mixed type of goiter. Note central white mass of fibrous tissue with cyst at top surrounded by areas of hyperplasia (darker areas) and colloid (lighter areas).

the fibrous tissue which is produced by the injection.

The result of an injection depends upon the quantity injected and the kind of goiter one is dealing with. Hyperplastic thyroids of pure type, whether the hyperplasia is diffuse or circumscribed, respond most certainly. A small circumscribed hyperplasia of either lobe or the isthmus will be materially benefited or cured by a single injection.

Miss W., (Case 16, reported in a former paper[2]) had a small but pronounced enlargement of the isthmus with pronounced symptoms of thyrotoxicosis, including tremor, tachycardia, and amenorrhœa, but no exophthalmos. She was cured by one injection and has remained well ever since, now about three years. A larger goiter but of the hyperplastic type would be materially benefited or cured only by several injections or one very large one.

The case of Miss J. H. (Case 6, reported in the same paper), who had a very large goiter of mixed type, required nine treatments, fifteen injections in all, to bring her weight, which was 86 pounds at the beginning, up to normal, cause the reappearance of her menses, and in short produce almost as perfect a cure as can be obtained by thyroidectomy. I subsequently removed this patient's goiter for cosmetic reasons. This operation was followed by slight further improvement, especially in the exophthalmos. She has a permanently damaged heart.

[2] J. Am. M. Ass., 1913, July 12.

These two types of goiter are shown in Figs. 7 and 8. These plates were made in color from freshly removed specimens. Figure 7, made from a gland removed from a patient with moderate hyperthroidism, shows a hyperplastic goiter with a distinct adenomatous enlargement. An injection into any part of this gland would be followed by marked amelioration of symptoms.

On the other hand, Fig. 8, which was made from a gland removed from a patient with mild symptoms of thyroid intoxication, shows a large amount of fibrosis, some colloid, some cyst formation, and scattered here and there small areas of hyperplasia. For reasons that are patent, such a case would require numerous injections to produce pronounced benefit. Moreover, some of the injections would be followed by no noticeable benefit at all. For instance, an injection into the fibrous tissue or into the cyst would be practically useless, so far as amelioration of symptoms is concerned. That the injections will produce a marked diminution in the size of the gland is proved by the experience of Morris, O'Day, and myself. The diminution in size, like the abatement of the symptoms, will be most marked in the vascular hyperplastic type of goiter, though according to Morris it is often marked in the cystic type.

I have never used the injections for the sole purpose of reducing the size of the tumor. Given a case wherein one lobe of the gland has been removed, with later hypertrophy of the remaining lobe accompanied by an exacerbation of the symptoms of thyrotoxicosis, and we may depend upon the injection of boiling water to benefit or cure the symptoms and to cause the tumor to disappear or to stop its growth. Such a case is Case 8 in the paper above referred to.

It was formerly thought that the injections would cause the gland to become adherent, and thus increase the difficulty of operation in case removal was subsequently done. We now know that this fear of adhesions was unfounded. Where the injections are made well into the substance of the gland no adhesions follow. If numerous injections are made and particularly if some are made near the surface of the gland, some adhesions will be found if thyroidectomy is subsequently done, but as above indicated the formation of adhesions as a result of the injections may be regarded as a negligible factor.

Technique. An all-glass syringe of 10 ccm. or 20 ccm. capacity is best. The greater the capacity of the syringe, the longer the heat of the water is retained. The needle should be long, flexible, and rather fine. The syringe is boiled with the water over a gas or alcohol flame by the side of the table or bed on which the patient is lying. After proper cleansing, the areas to be injected are infiltrated with one per cent novocaine. The filled syringe is removed from the water, which is actually boiling, and the injection quickly made. From five to twenty ccm. are injected according to the size of the lobe. By partially withdrawing the needle and reinserting it, contiguous areas may be injected through one puncture.

Dr. Babcock has made injections in his office, but thinks as I do that this is not to be commended. I prefer to have the patients remain quiet for one-half hour or an hour after the injection. The needle punctures are covered for a couple of hours with gauze wrung out of alcohol. Sloughing has never occurred and the small eschars on the skin produced by the needle are not permanent. The needle should penetrate the skin as nearly at right angles as possible in order to reduce the burning to a minimum. I have been in the habit of handling the syringe with the aid of forceps and gauze but in the future shall use Babcock's method, which is much better. He wears three pairs of gloves: first, a pair of rubber gloves covered with thick cotton gloves, and over all a pair of rubber gloves.

Most patients complain immediately after the injection of a feeling of fullness in the goiter and some pain in the sides of the occiput, but the discomfort is really trifling.

The injections are to be repeated until the desired effect is attained. If one is using the treatment preparatory to thyroidectomy, then it is well to repeat the injections every two or three days, if more than one is necessary; but if one has decided to try to effect a cure by this means, it will be better to wait a week or

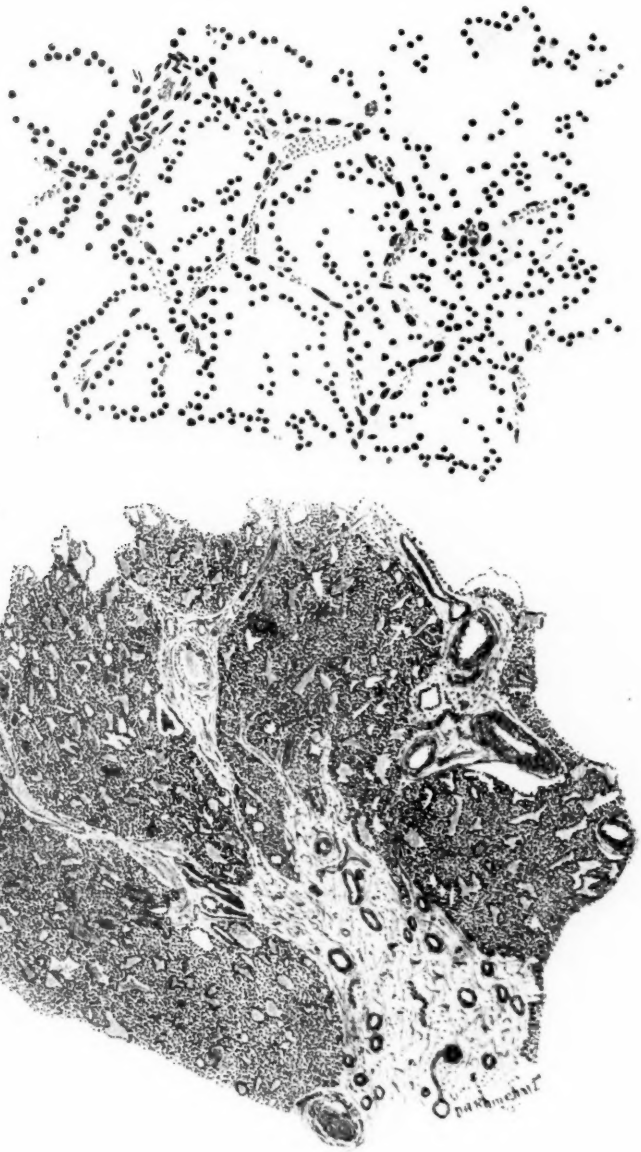

Fig. 3 (above). Dog's thyroid. Section made from point somewhat removed from site of injection showing absence of colloid and separation of cells from the basement membrane.

Fig. 4 (below). Dog No. 3, killed eight weeks after injection of thyroid with hot water. Gland removed and sectioned. Note the great amount of fibrosis and small amount of colloid. (Miles F. Porter.)

ten days before repeating the injections, for, as indicated above, while the improvement is usually marked within the first forty-eight hours, it does not reach the maximum for ten days or two weeks.

It is better, especially in the larger goiters, to inject two, three, or more areas at one séance than to make the injections at intervals. Indeed, I may say that the tendency is, as experience grows, to make larger and multiple injections at a single séance rather than to make smaller and single injections and repeat the séances. In some cases with small, ill-defined glands it is better to make the injections through a small incision in the midline, done under local anæsthesia, which will enable the operator to do the work under guidance of the eye.

The clinical and experimental facts seem to warrant the following conclusions:

1. Injections of boiling water into the gland should be substituted for the so-called medical treatment in patients with small thyroids and moderate symptoms of hyperthyroidism.

2. This method is also peculiarly well adapted to the treatment of patients with moderate or severe symptoms and relatively small glands and especially to cases wherein the hyperplasia is circumscribed. It is therefore well adapted to the treatment of patients who have had a lobectomy done and are still suffering from symptoms of hyperthyroidism with hypertrophy of the remaining lobe.

3. Patients with large goiters and extreme symptoms of hyperthyroidism should be treated with the injections until they become safe surgical risks and then have the gland removed.

4. Boiling water injections are not recommended in non-toxic goiter. In such cases, as in patients with large goiters and toxic symptoms but who are good surgical risks, thyroidectomy should be the chosen method of treatment.

5. In substernal hyperactive goiters the removal of which would be hazardous, boiling water injections under guidance of the eye should be tried.

THE DIAGNOSIS AND TREATMENT OF OSTEOMYELITIS[1]

By MALVERN B. CLOPTON, M.D., F.A.C.S., Saint Louis
Associate in Surgery, Washington University
From the Surgical Department of Washington University

I HAVE selected the topics of diagnosis and treatment of this disease because they have appealed to me as the most important phases for discussion. The etiology and pathology have been carefully and thoroughly worked out and we can accept them as nearly closed chapters, but most new cases present some question of diagnosis, and the treatment of the cases must always be considered with the view of the earliest relief of symptoms by such measures as will ultimately give us the best functional results in the diseased extremity.

The following observations are based on our experience with thirty-one cases treated in the past four years. Nine of these cases were admitted in the acute stage. So far there have been no deaths.[2] The femur was involved 23 times, the tibia 11 times, the humerus 6 times, the radius 3 times. In nine cases the femur alone was involved, in eight cases the tibia alone, in two cases the humerus alone, and in one the fibula alone; that is, in nineteen cases only one bone was involved. There were fifty bones involved in the thirty-one cases. The hips were involved in fifteen cases; six of the hip cases gave symptoms similar to tuberculosis of this joint, and three of these cases had been treated for tuberculous hip disease.

DIAGNOSIS

In the acute stage the general sepsis may so mask the local lesion that it is impossible to locate the trouble in the bone, or the bone lesion may not be suspected. In these cases, typhoid fever is frequently diagnosed, and our histories show a fair proportion in which the bone abscess has been thought to come from this infection. In the earliest stage, the leucocyte count, usually high (from 20,000 to 30,000), should cast doubt on the typhoid diagnosis, and an earnest search made for the bone lesion. The pain caused by the inflammation inside the unyielding bone is usually one of the earliest symptoms, but in the child the intoxication may be so overwhelming that pain sense is overshadowed, and only the most systematic examination of the bones will discover the tender shaft. If pain is felt in the neighborhood of several joints at the same time, either developing simultaneously or in sequence, the mistaken diagnosis of infectious arthritis may be made, but in osteomyelitis the infection is usually of a less intense character and the number of joints involved are fewer. Even in the earliest stage of bone infection, there is thickening about the shaft, which is also very tender to the slightest pressure, and the lesser pain, on manipulation of the joint, may serve to rule out infectious arthritis. The mistaken diagnosis of infectious arthritis is more likely to occur in infections of the bone that do not early break through the cortex to form swellings beneath the periosteum. There is also that class of cases in which the infection begins in the diaphysis near the epiphysis, and which, by their toxins or organisms, cause the swelling in the adjacent joint. Here the appearance of joint-disease is often most deceiving, developing the picture either of a septic arthritis or, if the inflammation is not of a virulent nature, of tuberculosis. In osteomyelitis of the neck of the femur, the symptoms of tuberculous hip disease may be nearly reproduced, but bearing in mind the chronic nature of tuberculosis, the diagnosis is ordinarily not difficult to make. Although we have been on the lookout for it, we have never seen tuberculosis of the shaft of the bone; it is practically always of the epiphysis and rarely gets beyond the epiphyseal line. In children the tuberculin reaction of von

[2] An infant came into the hospital suffering with acute sepsis and died within sixty hours after onset. We felt that this case might be an osteomyelitis of the femur, because of a very slight thickening of the bone, and it was accordingly drained. No pus was found, and the microscopic examination of the bone showed a few minute abscesses. Cultures from the bone gave staphylococcus aureus. The same organism was also obtained from the blood. It was too early in the disease to determine whether this was osteomyelitis or a general sepsis. No autopsy.

[1] Received for publication August 22, 1914.

Fig. 1. Case 1, showing complete regeneration of bone after subperiosteal resection.

Pirquet is of value, though several of our cases of osteomyelitis have a positive reaction due to tuberculosis of other parts than the bone. The appearance of an abscess either under the periosteum or in the soft parts usually makes the diagnosis certain, should the case have progressed so far without being determined; but there are some slow osteomyelitic processes, notably about the lower end of the femur, that at times may be diagnosed as sarcoma, while on the other hand, there are certain new-growths of the shaft of the bone that give a very suggestive impression of chronic osteomyelitis.

But most of these situations of doubt have arisen in the earlier stages of the disease and can usually be cleared by X-ray study. In the first few days of osteomyelitis, we have been unable to see any change in the bone-shadow, but later there comes a general cloudiness due to the hyperæmia and the beginning absorption of bone trabeculæ which make the picture more or less characteristic. This absorption and loss of definition is at first in the shaft near the epiphyseal line. As progress is made, the lacework of the bone trabeculæ of the cancellous bone and the medulla are destroyed, and the periosteum later is irritated into activity that after a few weeks shows a shadow of a linear arrange-

Fig. 2. Case 2, showing complete regeneration after subperiosteal resection.

ment of newly formed bone salts; and this thickening may extend some distance along the shaft beyond the part where there is medullary destruction. Such periosteal thickening is characteristic, is never seen in tuberculosis, and is evidence that we are not dealing with malignancy. The medulla may show irregular hollows with ragged outlines that contain bone detritus. Sequestra come as a later stage, and while not always formed, are only found in osteomyelitis. Should the blood-supply of the shaft, or any part of it, be cut off by the swelling within and without the bone tube, the shaft dies and it is left to show later as a very dense mass. After the sequestrum has been removed and the infection is resolving, the image clears and the bone becomes more opaque as sclerosis of a compensatory nature seeks to strengthen the weakened part. We may also find in old conditions an abscess of the bone with irregular outlines, containing either a sequestrum or without anything but minute bone detritus in the granulations. In tubercular disease the epiphysis is involved and instead of the clear outlines, there is a fluffy effect with blurring, and the cancellous tissue is difficult to detect; and from a pictorial point of view the X-ray plates of tuberculosis are disappointing. Cavities are not so clearly outlined because of the deficiency of mineral salts, and we do not see the sclerotic changes with excessive mineralization seen in osteomyelitis. Syphilis of the joint gives a shadow in nearly all respects identical with tuberculosis, but in syphilis of the shaft, the X-ray shows an irregular thickening and a mottled appearance of the bone, the periosteum showing a very characteristic furring, quite unlike the regular laminated appearance in osteomyelitis. There are never any clear-cut cortical sequestra. The subperiosteal thickening of the tibia in congenital syphilis often gives a regular smooth outline, but at times it can be shown that the primary lesion is in the medulla. In malignancy of the bone as shown by the X-ray there is a ragged irregular ossification and the effect is spotted and not uniform. Irregularity in every form of bone malignancy is a prominent feature. In endosteal growths the rapid expansion of the bone shell is evident. It is

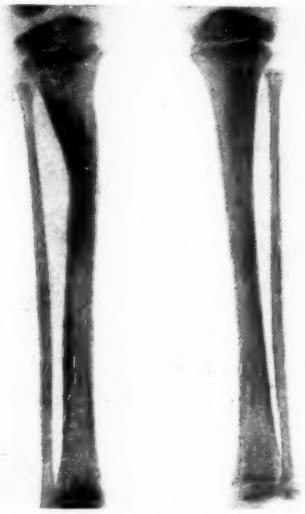

Fig. 3. Case 2, comparing legs two years after resection. Note the conformation.

easy in most instances to rule out osteomyelitis in the diagnosis of exostoses. The X-ray diagnosis of bone-cysts or giant-celled sarcoma of bone is difficult except in the later stages. We regard the X-ray as invaluable in all work on the bones, particularly so with osteomyelitis, and therefore insist on a picture that gives us clear and definite detail before we undertake treatment.

TREATMENT

1. In the acute stage:
   Drainage of medulla.
2. In the subacute stage:
   (*a*) Humerus and femur — drainage and sequestrotomy.
   (*b*) Tibia, fibula, radius, ulna — subperiosteal excision.
3. In the chronic stage:
   (*a*) Sequestra — removal, drainage with iodoform wax.
   (*b*) Brodie's abscess — evacuation, closure over blood-clot or iodoform wax.

In the operative treatment of the acute stage of osteomyelitis, the greater responsibility rests with the operator, because he must do enough to release the pent-up infection and refrain from doing too much and endangering

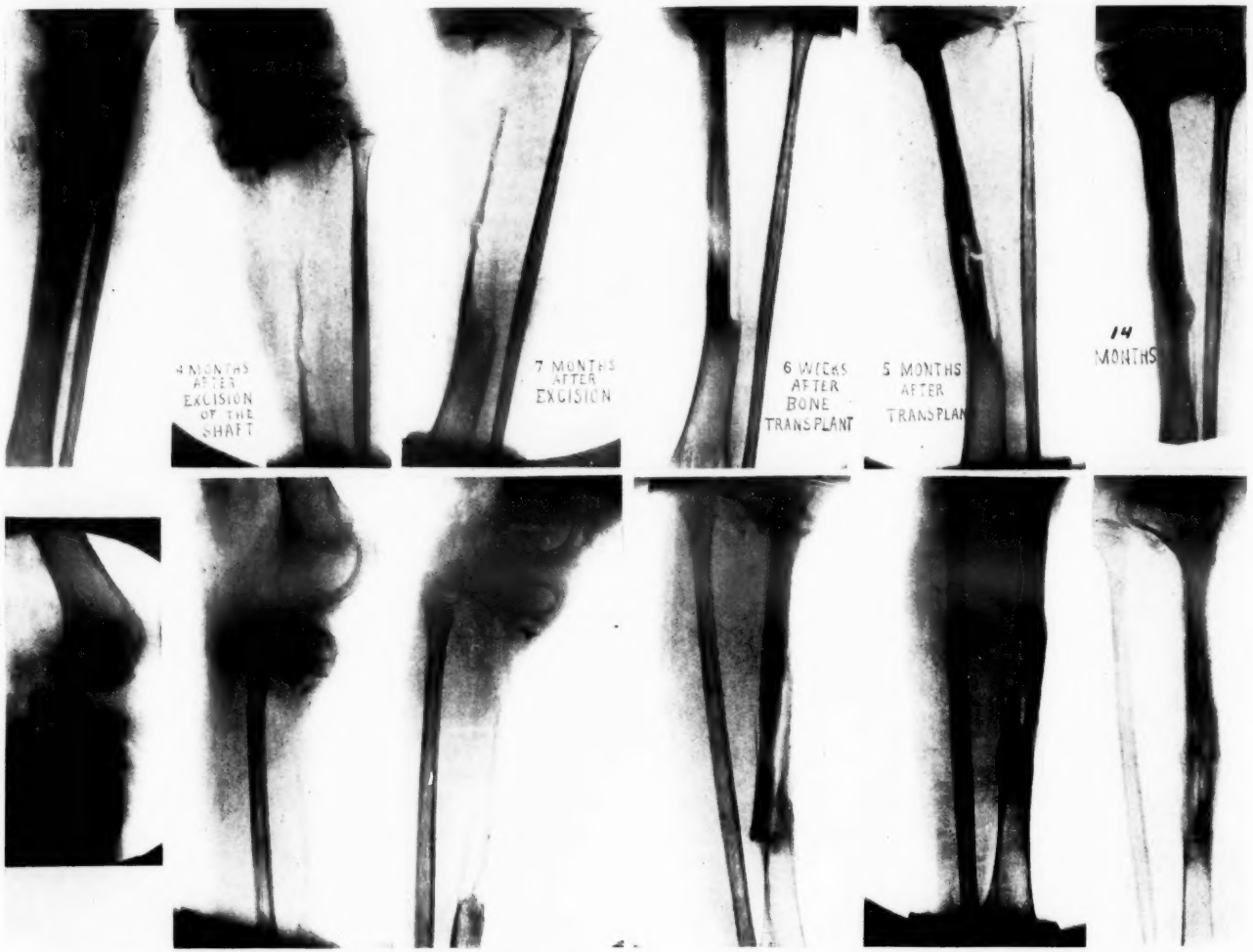
4 MONTHS AFTER EXCISION OF THE SHAFT
7 MONTHS AFTER EXCISION
6 WEEKS AFTER BONE TRANSPLANT
5 MONTHS AFTER TRANSPLAN
14 MONTHS

Fig. 4. Case 3, showing a case in which there was partial failure to regenerate bone after subperiosteal excision in osteomyelitis of tibia, and in which it was necessary to transplant a piece of the opposite tibia. Result excellent.

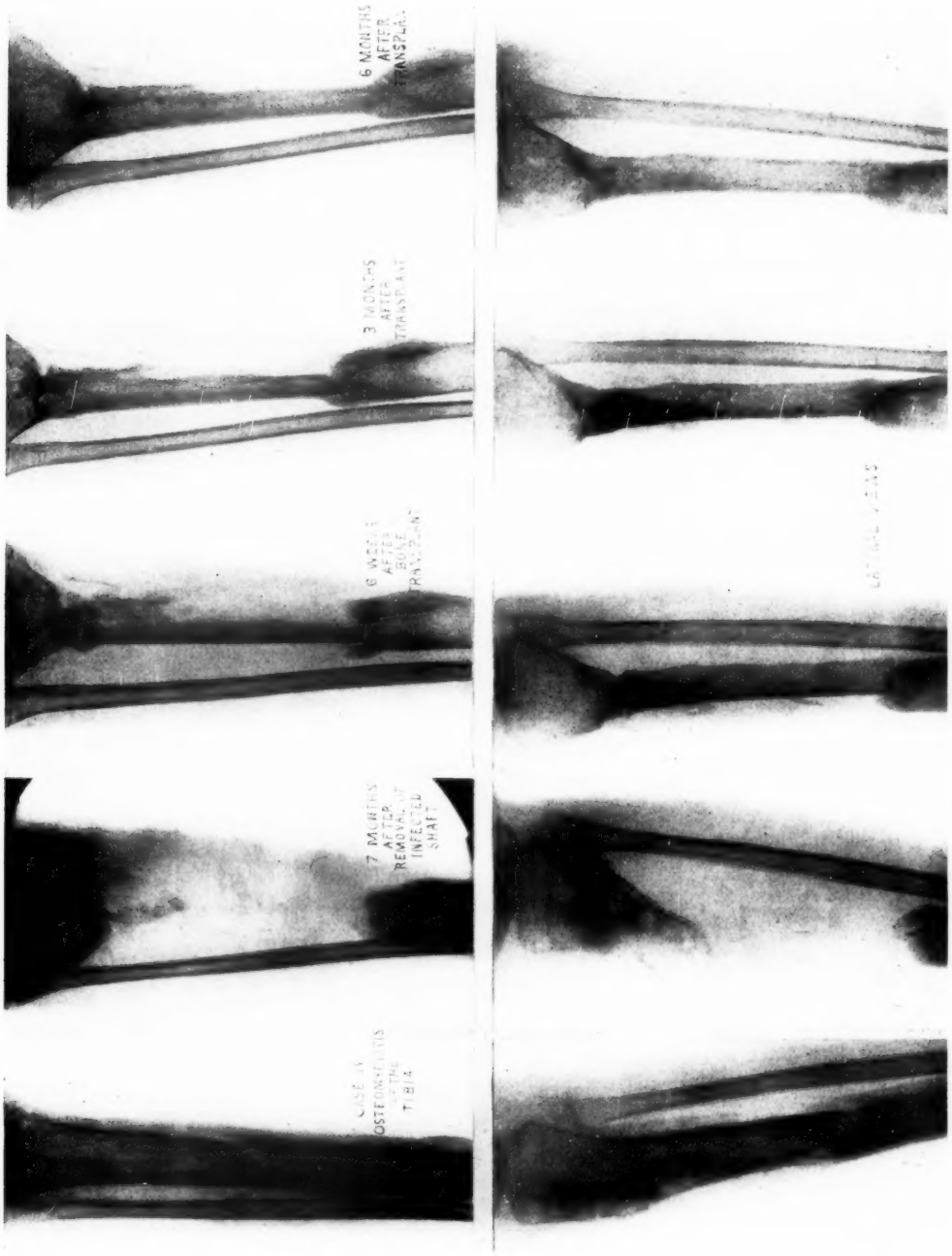
6 MONTHS AFTER TRANSPLA
3 MONTHS AFTER TRANSPLANT
6 WEEKS AFTER BONE TRANSPLANT
7 MONTHS AFTER REMOVAL OF INFECTED SHAFT

Fig. 5. Case 4, showing a case in which there was a failure to regenerate after subperiosteal excision. Transplant from opposite tibia to bridge defect. Excellent result.

Fig. 6. Case 10. In this case there was a partial failure to regenerate after excision. Graft inserted one year later. Result excellent.

the life of the bone that is involved. When possible to locate with the skiagraph the bone involvement and to measure its extent, the shaft is exposed and a lid of cortex is removed throughout the length of the inflamed medulla. If the case has progressed to abscess formation either beneath the periosteum or in the soft parts, after these have been incised the shaft is opened along one side. Drainage is sought for only part of the infected medulla and no effort should be made to "clean out" the infection. Our endeavor should be to spare the infected bone-cavities as much as possible to get the benefit of all of the endosteal regeneration possible. The communication of the medullary spaces, which the breaking down of walls by infection makes more complete, allows for drainage even at some distance from the cortical opening, so that we content ourselves with opening into the middle of the medulla. At times a large part of the bone inside the cortex appears on the X-ray plate so mottled and irregular as to indicate complete destruction, and over this changed area and much beyond it the periosteal action develops much new bone, but on draining the medulla of pus the less changed parts return to normal without being directly attacked. Months later the entire thickened periosteum along as much as half of the shaft has returned to normal after only a small part of the medulla has been opened at a point far distant to periosteal thickening.

When the subacute stage has been reached, with a sinus remaining and a general bone thickening, possibly some fever, and an anæmia of more or less severity, our procedure will be determined largely by the condition of the bone as shown by the X-ray and the location of the lesion in the bony skeleton. If the femur or the humerus are involved, as they are the only bones in these parts to support the limb, our purpose is to allow healing to proceed, while the old shaft gives support. If the infection has been extensive or drainage has been inadequate, it is very likely that a sequestrum of a larger or a smaller part of the shaft will result. The periosteum has been actively building the involucrum and we have to wait to carry out a radical procedure until the encircling new bone becomes strong enough to support the limb. If in the meantime there is insufficient drainage at any point, this must be obtained. In the course of two or three months the involucrum is fairly firm and, assuming that a sequestrum has formed, we are ready to remove it. As small a channel as will permit the extraction of the intact sequestrum is made down one side of the new bone and the dead bone removed. We have been able to do this usually without much dissection of healthy tissue, so that few avenues of fresh infection are opened. The cavity left by the extraction of the sequestrum should be dealt with very gently. We are convinced that

much damage is done by too energetic efforts to disinfect and make clean, so we confine our efforts to wiping out the cavity with gauze alone, which removes from the inside of the involucrum very few of the granulations on which we must depend for the new shaft. Nor do we use any disinfectant washes or swabs. We do, however, obtain some bacterial inhibition by the introduction of hot Mosetig-Moorhof's wax,[1] which we find the most satisfactory of all dressings. In the pus-producing, acute stage we drain our bone-cavities and abscess of the soft parts with gutta-percha tissue, but in the late subacute or chronic stages when we are looking for bone regeneration we use the iodoform wax exclusively. The advantages are that it will heal in without acting as a foreign body; and should there be any drainage necessary, the discharge can escape beside the plug and reach the surface. It is our practice in some cases to close the wound completely. At times we leave the wound open, and it is in these open wounds that we find the wax most useful, as it makes healing painless. Should gauze be used it is necessary to remove it from time to time, which always causes much suffering and, too, each removal destroys a certain number of bone-forming elements. Old bone wounds that have been painful to handle and have a foul discharge when dressed with gauze drains have been made painless and have cleaned up in a few days and gone on to early healing under the wax dressing.

The abstracts of the histories of the following four cases show the results of the handling of infection of the bone where the femur or humerus have been involved.

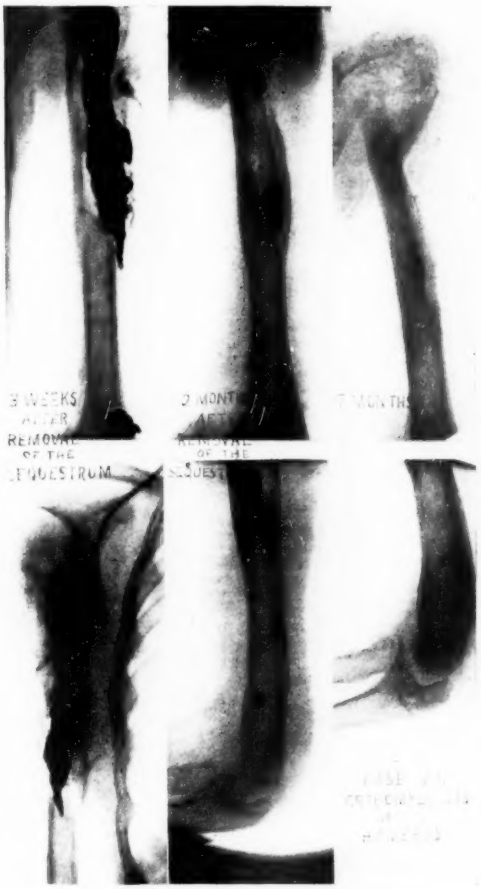

Fig. 7. Case 8, showing the use of Mosetig-Moorhof wax to act as a drain after removal of a sequestrum. It is partly absorbed and partly extruded.

CASE 5. Children's Hospital, No. 2,072. M. B., age 6; osteomyelitis of right femur, left femur, os magnus, left scapula (Fig. 8).

Child was admitted October 16, 1911, after three days of illness, with complaint of pain in right thigh. From the start she had been very sick, and the sepsis had been profound, so that the pain in the thigh had occasioned little distress. On examination we found a general thickening of the upper part of the right thigh with tenderness, a large swelling over the front of left shoulder and a swelling over the right wrist. Under ether the left shoulder-joint was opened and a quantity of pus let out; the right wrist was opened and the necrotic and loose os magnum was taken out. The right femur was opened from the trochanter downward for five inches; there was much thickening of the periosteum with a collection of pus beneath. The medulla was opened and drained by making a channel with a small curette. Cultures from each involvement showed staphylococcus aureus. The shoulder healed kindly in about ten days, the wrist in a little longer time. The thigh had healed by November 25th (6 weeks after operation). An X-ray, at this time, showed a cloudiness of the entire upper half of femur and extending up to the head of the bone. There is about ten degrees of motion in the hip. After the second week her temperature

[1] The Mosetig-Moorhof mixture consists of iodoform 60 parts, spermaceti 40 parts, and oil of sesame 40 parts, mixed by gradually heating to 100° C. When cold it solidifies. When used it is heated until it melts and is then poured into the cavity.

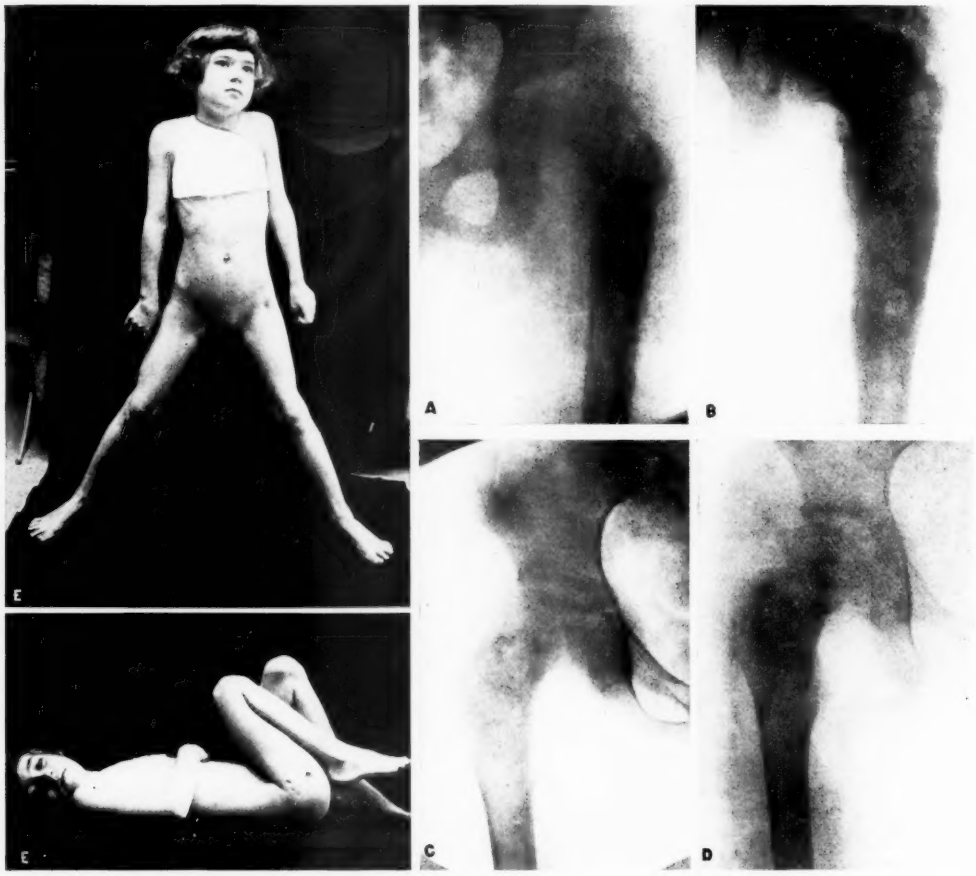

Fig. 8. Case 5. Child had both femurs involved. Photographs E and E show latitude of motion after 3 years. A and B show right femur which was involved in an acute process. A, October 11, 1911; B, February 11, 1913. C and D show the left femural neck, seat of a Brodie's abscess. C, February 14, 1912; D, November 25, 1913.

remained down, and there was a rapid gain in weight. In the fifth week there were night-cries, with flexion of the left thigh and muscle spasm, just as seen in tuberculosis of the hip. The left leg was put in extension and all symptoms disappeared within a week. After three months an X-ray showed the right thigh gaining in bone structure, but several small sequestra remained, which were removed through small incisions. The child then developed diphtheria and later chicken pox, and was removed to the contagious disease ward, where she remained for six weeks. The only untoward symptom developing was night-cries, evidently from left hip, but the X-ray showed so little change in the bone that nothing was done to it at that time. The child went to Ridge Farm for a month where she gained in strength and the hip improved. She returned February 1, 1913, for operation. An X-ray picture showed the neck to be the seat of an abscess about three-fourths of an inch in diameter, situated near the epiphysis of the head. This was operated February 6, 1913, under gas, and a cavity in the neck was found to communicate with a small focus in the head, and both were lined with eburnated bone. The hip was involved by a direct connection with the abscess. A part of the eburnated wall was cut out and the cavity allowed to fill with blood-clot, and the wound closed, except for a small rubber-tissue drain. Wound healed kindly and was closed in a month. Tissues put into the guinea pig did not develop tuberculosis; cultures from pus gave staphylococcus. Child was kept in bed with traction for two months,

Fig. 9. Case 16. Osteomyelitis of femur. X-rays on admission, two weeks, ten weeks, and four months later. Excellent results.

after which a cast was applied and, at the end of four months from the operation, was using the leg in walking. The X-ray plates show the condition of both hips at present and the condition of the right femur. She walks without a limp. The flexion and abduction are as free as normal, as shown in the photograph. The osteomyelitis of these parts is well. To show how tenacious the infection may be, it is noted that the child was admitted to the hospital in March, 1914, when in the best of health and general condition with a fluctuating mass the size of an English walnut over the left scapula, which when opened showed no pus but a gelatinous mass from which staphylococci were grown. It had its origin in a small bone-focus of the posterior margin of the scapula which was excised and the wound closed, except for a small rubber-tissue drain. Healing was rapid.

Case 12. Children's Hospital, No. 3,726. H. M., age 7; osteomyelitis of left femur, right humerus.

The child was admitted to the hospital December 31, 1912, with the history of a fall five months before. She was able to walk for a few days, after which she was confined to her bed and she has remained there ever since. In the beginning there was pain in the leg, and fever, and after six weeks she was taken to a hospital, and the thigh was incised and pus evacuated. The leg has been draining ever since. She remained in the hospital for four months and got progressively worse, losing much weight and becoming so weak that preparations were made for amputation. The family would not consent to this, so the child was brought to the Children's Hospital. Her condition was bad. The left thigh is much swollen from the upper part to below the knee. There is a large opening on the inner side of the thigh from which there is a large discharge of thick yellow pus. There is a fracture of the thigh at the junction of the middle and lower third which allows wide motion. There is over two inches of shortening in the thigh. Cultures show staphylococcus. An X-ray shows the femur involved from the lower epiphysis up to a point just below the trochanter. There is a large thin sequestrum of the circumference of the shaft about two inches long. This lies just below the fracture. There is a marked angulation at the fracture. Under gas anæsthesia the incision was lengthened and a sequestrum two and one-half inches long of practically the whole circumference of the femur was removed. Small drains were inserted and, after correcting the angulation at the break, a plaster cast was applied. Three weeks later the sinuses were swabbed out with gauze and iodoform wax put in. At the end of two months the fracture was solid and the child was walking on the leg at the end of the third month. The child was readmitted July 16, 1913, with a small fusiform swelling of the right humerus above the middle, which was without pain or tenderness and which did not disable the arm. The X-ray picture showed a small area on

Fig. 10. Case 22. Osteomyelitis of humerus of four weeks' standing. Excision four inches of upper end of shaft. Regeneration as shown at end of four months. Wound healed; useful arm; no shortening.

one side of the cortex which is punched out and irregular. The periosteal thickening extends several inches above and below this point. The child was without fever, and while in much better condition than on discharge, her hæmoglobin was 70 per cent; four and one-half million red blood-cells and nine thousand leucocytes. Her thigh has a small sinus, but very little discharge and she runs about without discomfort. On July 24, 1913, the arm was opened under ether, and a small cavity found with markedly eburnated walls, which were cut away and the cavity filled with iodoform wax and the wound closed. No pus was found—only a gelatinous granulation tissue. The healing was without discharge two weeks, when a little of the bone wax came out and the wound closed immediately. She was transferred to the convalescent home at Ridge Farm after two weeks, where she stayed for two months, gaining rapidly in weight and strength. The child has been readmitted to the hospital twice for the treatment of small collections of pus that form about the scar of the old healed sinus of the thigh, but she recovers in a few days. This is the only evidence of the old trouble, aside from the shortening of the limb due to the break and destruction in the bone previous to the time of the first admission. The angulation in the bone has gradually straightened out so that to all outward appearances the thigh is straight. This result we count as one of the most satisfactory in our series. It shows that even after great destruction from infection and even fracture of the bones, we may get a splendid result.

Case 17. Children's Hospital, No. 5,943. V. C., age 8; osteomyelitis of the left femur; pyelitis.

The boy was admitted October 21, 1913, complaining of pain in the left hip, which had begun one week before. The child was unable to walk, went to bed the second day, and has not moved the leg since, because of the intense pain at the hip. There has also been pain in the knee. There was fever, but not very high. When first seen, his temperature was 100°, but he looked sick and distressed. His musculature was poorly developed, but the general examination was negative except for a reddened pharynx and very large tonsils. He lay in bed with the left thigh flexed to 45 degrees and abducted widely. This thigh was swollen and red in the upper two-thirds and exquisitely tender. The swelling was most prominent below the anterior superior spine, and this extended backward to the tuberosity of the ischium. Fluctuation was made out below and to the inside of the anterior spine, and behind, above the trochanter. The X-ray showed an osteomyelitis of the upper end of the femur, which had invaded the trochanter and neck. The head of the bone appeared healthy. The shaft of the bone was invaded for about two inches in the upper part. On October 22, 1913, under gas anæsthesia, incisions were made below the anterior spine and over the trochanter, evacuating a large abscess. The trochanter was so disintegrated that only the outer shell remained. A channel of bone was cut through the trochanter and neck for an inch, and down the shaft, and a rubber-tissue drain inserted. The abscess of the soft parts was drained freely. Cultures showed a staphylococcus. The boy's general temperature remained high and the pulse was weak. The drainage was profuse and the thigh diminished in size. At the end of ten days we could bring the leg in normal position by means of extension. One month after admission it is noted that the general condition had improved, but the boy continued to have a mild septic temperature. The tenderness which had been noticed over all the femur had disappeared except near the trochanteric end, and here a small abscess of the soft parts made its appearance and was opened. An X-ray showed a pronounced disarrangement of the bone structure of the upper two inches, and under gas the wound was reopened in the shaft, but no pus was found. A small abscess in the neck near the epiphyseal line of the head was opened and drained. There was an improvement for a time, but the septic appearance still held, and the urine began to show more and more pus. From this time on, the osteomyelitis ceased to worry us and all our efforts were directed to the kidney infection. It is now eight months since the child was admitted, and since the

first month the bone lesion has been healing or well. The hip is motionless, the femur is healed, and the boy is up and about. But during all this time there has been not more than two months in all in which the boy has been free from temperature, ranging as high as 101° and 102° in the evenings. For a time his leucocyte count kept constantly above 18,000. By changing the reaction of his urine from acid to alkaline, we have been able to overcome some of the infection and he would get better for a time, to relapse again. The urinary infection is staphylococcus. Vaccines have been used without effect. His tonsils and adenoids have been removed. No other lesion can be made out to account for the fever. The tuberculin and Wassermann reaction are negative. But despite the fever, the boy continues to feel well, eat and sleep well, and gain in strength.[1]

CASE 8. Children's Hospital, No. 3,346. E. L., age 10; osteomyelitis of humerus. (Fig. 7.)

Boy admitted September 29, 1912; had been healthy until three months ago, when shoulder began to pain and the shoulder and elbow became swollen in two days. An abscess near the shoulder was opened and continued to discharge. The swelling was not as marked as in the beginning. He is restless and does not sleep well. His appetite is good. The movement at the shoulder is painless, but any movement at the elbow causes pain. Examination shows a fairly well nourished boy, somewhat pale. Chest and abdomen negative. Right shoulder and elbow the only joints involved. Right hand shows marked atrophy of disuse. Elbow-joint allows only a few degrees of motion and this is painful. Supination and pronation in forearm absent. Forearm fixed at a right angle. The entire shaft of the humerus is very much thickened. About the shoulder, four granulating wounds discharge thin yellow pus. The acromion is thickened and prominent. The upper end of the humerus is very much enlarged. X-ray picture shows an osteomyelitis, involving the whole of the shaft of the humerus. The head of the bone seems free from change, but beginning at the upper epiphyseal line and extending downward along the upper third of the bone there is marked thickening, which has in the center a shadow of sequestrum. The lower end of the bone seems to be rather uniformly thickened. The periosteum is raised for about one-eighth of an inch all along the shaft. The elbow-joint seems also to be the seat of deposit of new bone. There is also some destruction of the ulna surface of the joint. The bone is excavated and roughened. An operation was performed October 3, 1912, to excise the sequestrum. The incision was made from the level of the shoulder-joint, half-way down the arm on the outside. The periosteum of the humerus was universally thickened to one-fourth inch and of a consistency that would just permit cutting, with a heavy scalpel, a channel about one-half inch wide, through which the sequestrum was removed. The sequestrum measured four inches in length and lay in a granulating cavity, which was wiped out with gauze. The lower end of the sequestrum extended down to the musculospiral groove, but the nerve and the surrounding tissues were not interfered with. A small trephine hole was made to open the lower end of the humerus about one inch above the joint, hoping in this way to determine any suppuration of the medulla and to drain it if necessary; but no infection was shown. Both bone cavities were filled with Mosetig's wax. The wounds were partly closed with catgut in the muscle and fascia and interrupted silk for the skin, leaving about one inch interval between the sutures. There was a moderate amount of discharge after the operation, but the wax remained in position. Two weeks later there was no reaction about the arm. Healing progressed favorably with the very little discharge. Motion in elbow was not increased. The lower wound healed *per primam*. Eight weeks after operation he was discharged from the hospital with the wounds almost healed. He was using his arm for light lifting, with good motion at the shoulder but the elbow has remained stiff. We expect to do an arthroplasty later.

[1] On September 3, 1914, a guinea pig was injected with 1 ccm. of the boy's urine, and died in 18 days, of tuberculosis.

There have been three cases with involvement of the upper end of the femur, in which the infection attacked the hip-joint, and the head of the bone had to be removed. It has been our practice after the healing of the shaft has progressed far enough to give a solid end, to insert this into the acetabulum and hold the leg in abduction to overcome the shortening. Two of these cases have healed long enough to insure satisfactory end-results (see also Case 11, page 20). The notes on the following case are given because of the unusual finding at operation and the rather early healing of the bone lesion.

CASE 21. Children's Hospital, No. 6,269. J. B., age 10; osteomyelitis of left femur at hip, and pyelitis.

The child was admitted January 8, 1914, with a history of a fall on the buttocks five weeks before, when a chair had been pulled from under her. For a week she was up and about and did not complain. Then the hip and thigh became tender and swollen; she could not use the leg, and she was sick. She lay in bed with thigh slightly flexed and rotated inward, with two inches apparent shortening. There was fluctuation over upper part of the thigh and hip. The X-ray showed the head out of the acetabulum. The upper part of the femur and neck had a wormeaten appearance. Under ether, the abscess was opened and the head and neck of the femur were found free in the abscess cavity and were removed. Extension was applied. Cultures gave staphylococcus. Her condition improved directly. There was still a sinus at the end of a month, but the bone

appeared in good shape on the X-ray plate. Several attempts were made to put the leg in abduction in a spica, but each time the infection appeared and the discharge became profuse. However, on June 16, 1914, six months after the first operation, she was given nitrous oxide and the old sinus opened widely and the acetabulum cleaned of tough fibrous tissue, the end of the femur inserted into the socket and held in marked abduction with a plaster spica. There was considerable pain for four days, and the temperature remained up. It then receded and the child left the hospital at the end of a month, practically healed, with the leg in a cast in abduction. She has done well since. This child had a pyelitis that showed at the end of the second month and lasted for a month. The tuberculin skin reaction was positive, but we were unable to locate the tubercular lesion.

When the infection has attacked either one of the two bones of the forearm or leg and the other can be relied upon as a splint during the healing, the treatment, after the primary drainage, has been to excise the diseased part of the shaft as soon as the periosteal reaction is evident. This method has more recently been popularized by Nichols, who called attention to the suggestion made by Ollier many years before that the infected shaft be removed and new bone be developed from the periosteum to replace it. In this way the infectious nidus is removed early, the consequences of a protracted septic intoxication avoided, and the nidus is replaced by new bone which is without infection and in which there are no sequestra to produce sinuses. An important point to determine is the proper time to remove the infected shaft, and of equal importance is to remove only the shaft and leave all the periosteum and such newformed bone elements as lie beneath it. Nichols suggested that the shaft be removed when, by needling the periosteum, it is possible to detect little bone spiculæ by their grating, and we have found that the shadow cast by the thickened periosteum makes an equally certain guide. It has usually been found that the shaft is ready for operation about six weeks after the infection began, but there is a variation either way from one week less to one or two weeks more. The involved shaft is in this way entirely removed, or at least to the extent of its involvement, and the tube of periosteum is sutured with fine catgut into a ribbon which joins the healthy parts of the shaft that remain. The wound is closed completely and incased in a plaster cast. At times, the healing will be almost by primary union, and after observing the wound through a window in the cast for a few weeks, it can be put into a permanent cast to await the development of new bone. New bone is first shown on the X-ray plates in from four to six weeks, and at the end of a few months the lower limb can be used for weight-bearing, with the precaution of a proper support.

In seven instances we have had perfect replacement of the removed shaft without a sinus (Cases 1, 2, 11, 16, 22, 23, and 30), and their period of disability was very much shorter than it would have been if treated by other methods. In some of these cases only the tibia was involved. One case (22) had the humerus alone involved, and the result in this case was so excellent that not only was healing very much more rapid, but despite the fact that there was no accompanying bone to splint the part, the arm healed in excellent position, and with no shortening. It therefore appears to us as good practice to treat all humerus infections by removing the shaft, if they come under observation early in the illness before a sequestrum is formed or the periosteal new bone is too thickly developed. Three of the cases had more than one bone involved, and the healing in the parts where the shaft has been removed has been many months earlier than in the parts where we had to wait for new bone to regenerate from the bone partially destroyed by infection and operation. Brief abstracts of some of the histories of the cases in this group are given.

CASE 2. St. Louis Mullanphy Hospital, No. 9,405. H. H., age 6; osteomyelitis of tibia. (Fig. 2.)

The child was admitted to the hospital August 22, 1911, with a history of a sudden illness beginning two months before, with high fever, delirium, and great pain in the left leg, which swelled rapidly. The fever continued for ten days, when fluctuation was made out below the upper end of the tibia and was lanced. There was a persisting sinus and the X-ray showed an involvement of the upper third of the tibia, with a small sequestrum. The periosteum was thickened. Cultures gave staphylococcus. On September 1, 1911, the upper third of the tibia was removed. The periosteum was stripped from the shaft and the shaft divided at the junction of the

middle and upper third. This end was lifted up and divulsed from the upper epiphysis. The periosteum which was thickened was sutured with catgut so that the lateral walls made a ribbon connecting the upper epiphysis with the lower fragment. Where the periosteum formed a pocket above and below, iodoform wax was poured in. (These are the only two cases in which we used wax and we do not believe it offers any advantage.) The wound of the skin and soft parts was closed and the leg enclosed in a cast. The wound was dressed on the tenth day and found to be without discharge and closely healed. He left the hospital at the end of five weeks and new bone showed then on X-ray examination. He returned from time to time for examination and the progress of the new-bone formation is shown on the X-ray plates taken at such times. He was excessively active and on this account a splint was provided and he was kept from walking without support until nine months had passed. There has been no trouble of any kind with the leg and the new bone is now to all appearances just the same as its fellow. (Fig. 3.)

CASE 23. Children's Hospital, No. 6,674. E. G., age 11; osteomyelitis of left radius, right femur, and right tibia.

Before admission to the hospital on April 11, 1914, the child had been operated on twice. The illness has dated back five weeks with high fever and great prostration. The left forearm was first attacked, followed shortly by pain in the left leg. The abscess that formed at the wrist broke, and the leg was incised. After four weeks he was taken to a hospital where operations were performed on the tibia, femur, and radius. An X-ray picture taken on admission showed the lower third of the radius destroyed, but with active periosteal regeneration. The tibia showed involvement of the upper half, which remained as a shell, the medulla having evidently been curetted away. The lower third of the femur was honeycombed and the seat of a fracture. The radial and tibia wounds had been packed with iodoform gauze, damming back the pus. Two days after admission the boy was operated under ether. Several loose sequestra were removed from the femur and the cavity drained. The tibia was opened by making a channel extending below the original opening. This new incision was drained with rubber tissue, but that part of the bone which had been vigorously curetted at a previous operation was filled with bone wax. The radius was reopened and drained and a small sequestrum removed. In two weeks the discharge had decreased markedly. The left radius gave us the most concern because of the deformity developing, which was like that of a Colles' fracture. The epiphyseal line seemed destroyed and the lower epiphysis slipped backward, with the arm more or less fixed in the pronated position, with the hand drawn to the radial side. To correct this deformity if possible, and to get rid of the infected material, an operation was done on the radius on May 2d, removing three inches of the shaft from the lower part and bringing the periosteum together. This was rather difficult, as the new bone developing under the periosteum was well organized. The bone, after being carefully stripped of this, was divided about the middle and lifted out at the epiphyseal line last. From the smooth granulating appearance of the inner side of the epiphyseal line we judge that at least that part was destroyed, although the ulnar part of the line appeared to be still active. The arm was molded almost straight. In three weeks, discharge at the wrist had ceased, and an X-ray after two months showed new bone almost of the size of the original shaft. There is still some deformity. The femur continued to discharge for some time, and at the end of three months (July 10, 1914) two small sequestra were removed, the granulation wiped out, and the cavity filled with iodoform wax. The tibia had been curetted before we saw the boy and was filled with iodoform wax. The cavity has gradually filled up; the wax had not been removed, as it had been forced forward as the cavity grew less. This plan was chosen because it was the most favorable instance to observe the healing in the old practice of cleaning out an infected bone and letting it fill up. The small uncovered wound remains, while the arm, which was treated by our custom of excising the shaft, is well and useful. But although the wound of the tibia has almost healed there is still a large cavity in the bone, and the leg is not going to develop any more new bone to judge from the similarity of the shadows in successive X-ray plates. Another unfortunate condition is the laxity of the knee-joint. On admission, the knee-joint was swollen; in fact, the whole limb was much enlarged. The knee would recede at first under bandaging, and then it would swell, with elevation of temperature, and become quite painful and hot. These changes were quite independent, as far as we could see, of the condition of the femur or tibia. Aspiration of the distended joint on no occasion has given positive cultures, but frequently the fluid has been turbid and contained pus-cells. For the past month the joint has been better than before. The cultures from the bone abscess are staphylococcus. The Wassermann and tuberculin reactions have been negative.

CASE 16. Children's Hospital, No. 5,923. M. P., age 9; osteomyelitis of left tibia and right femur.

The boy was admitted October 16, 1913. Five days before, he had injured the ankle, but had not broken the skin. There had been an open sore on the heel two weeks before, but it had healed. The day after injuring the ankle he had fever and vomited, and had some pain in the leg and swelling about the foot, and the ankle and lower leg were red and swollen, due to a cellulitis, but there was only a suggestive fluctuation. An incision gave no pus. The next day the inflammation was more extensive, and a few blebs were over the whole inflamed area. The X-ray pictures show no change in the bone structure above the right knee; the femur had become tender, but this showed no change in the X-ray plates. Blood-cultures showed staphylococcus.

Temperature was high. Despite the fact that nothing was shown on the picture, a sudden collection of pus beneath the periosteum demanded that an incision be made into the lower end of the tibia, draining the medulla for four and one-half inches with rubber tissue. The child was better the next day, but complained of pain on the inner side of the right femur at the level of the epiphyseal line. Nothing showed on X-rays. We watched this bone very carefully, and over night a large abscess developed which separated the periosteum for several inches. The bone was drained after opening the abscess. Nitrous oxide was used in all the operations on the boy. He continued to run a fever, and the discharge from the bones was profuse. Five weeks after the onset the plates showed a mottling of the tibia and femur. There was little or no general periosteal reaction over the tibia, due to the early lifting of the periosteum of the bones by an abscess. On this account we delayed removing the shaft, but saw that sufficient drains were in to prevent extension of infection. On December 9, 1913, seven weeks after admission, we removed, under gas, the lower third of the tibia, because the bone shadow showed the periosteum active. The wound was partly closed by bringing the periosteum together in a ribbon; and where periosteum was so hard and thick that it could not be molded, iodoform wax was poured in. Several sequestra were removed from the lower end of the femur. The child improved; new bone showed in the tibia, but the femur did not do well although it was well drained. The child developed an acute streptococcic sore throat while otherwise doing excellently. There was intense prostration with an extensive hæmorrhagic purpura over the arms, hands, and legs. The tibia had healed, but a superficial abscess developed, and the right knee, which had never bothered, suddenly swelled. Aspiration gave a pure culture of streptococcus (the femur was infected with staphylococcus) and the next day the joint was opened and drained because of the presence of a thick, yellow pus which had developed from this attack. The knee drained for several weeks, then healed, and has given no trouble since. The boy is now walking; there is a small sinus from the femur, but the tibia is healed. The right knee is stiff. (Fig. 9.)

CASE 11. St. Luke's Hospital, No. 20,229. E. M., age 11; osteomyelitis of left femur and left tibia; pyelitis; renal calculi.

The child was brought to the hospital September 12, 1912, by her physician, Dr. Nowlin of Montgomery City, with a history of an illness of two months, beginning with pain of the left tibia near the ankle, then of the whole left leg. The fever was high and a fluctuating mass appeared in front of the ankle, which was opened; and later several openings were made over the tibia as high as the knee, which have continued to discharge pus. There was a marked thickening of the upper end of the femur and a boggy mass was made out. The general condition was bad, the temperature going to 101° F. and the pulse ranging from 130 to 150. There were three or four stools a day. The X-ray pictures showed a complete destruction of the shaft of the tibia, with practically no shadow of periosteal thickening. The femur showed a mottling of the medulla of the upper five inches of the shaft and a complete disappearance of the neck. Under ether the tibia was drained by making a channel one-half an inch wide down the entire length of the shaft, this extending deep into the medulla, which was almost destroyed and contained many pockets of pus. At the hip a large abscess was opened from which were removed two loose fragments of the upper end of the femur that measured three inches in length. The neck had disappeared, but the head seemed solid and was left in place. It should have been removed, as was shown later. The improvement was very slow. The case was also very difficult to handle because it was impossible to put extension on the leg on account of the infection below the knee, and no means were at hand to prevent shortening due to the loss of the bone at the upper end of the femur. Partially to maintain proper conditions, the cast was applied from the chest to the toes. On October 24, 1912, about six weeks after the shaft of the tibia was drained, the X-ray showed some slight subperiosteal thickening, but we felt it was the proper time to remove the tibial shaft, mainly because there were small gritty particles in the granulation tissue about the opening of the tibia. Accordingly, by preserving all parts of the granulation tissue that contained small bone-particles and by carefully lifting the periosteum from the shaft with a sharp dissector, the whole of the tibia was laid bare except the upper inch. To facilitate the removal of the bone it was divided about its center with a chisel. The lower half was then lifted out of the bed and found to be completely separated from the epiphysis. The upper inch of the shaft was not destroyed and it was left in place. This was fortunate, as the length of the limb was already much impaired and this growing center was most valuable. There was very little bleeding. No tourniquet was used. The periosteum was sewed into a ribbon, as advised by Nichols, and a plaster cast applied, extending upward about the pelvis and holding the leg in abduction to prevent further upward sliding of the femur. The X-ray of the hip region, taken five weeks after the operation, showed the head of the bone in good condition, and some new bone forming from the periosteum where the loose sequestra had been removed; but the femur had slipped upward five inches so that its upper end was higher than the acetabulum, due to the fact that no extension could be applied. Another picture taken six weeks later, after holding the leg in abduction, showed that we had, at least, prevented any further shortening; in fact, had brought the upper end of the femur down one inch, opposite the acetabulum. Eight months after the operation the discharge from the hip had almost stopped, and the X-ray showed a bridge of bone forming to replace the neck. The head was still in the joint. Fifteen

months after the operation a sinus still persisted at the hip and an X-ray picture showed the head forced out of the joint and lying free in a cavity below the bridge of bone representing the new neck. The head was removed in January, 1913, by enlarging the sinus and lifting it out with the finger, as it was loose. The acetabulum was filled with granulations, which were wiped out. A part of the cavity was occupied by the new neck which seemed firmly anchored. A small drain of iodoform beeswax mixture was poured into the sinus. This drained some for a time. The wax was gradually extruded and now the leg is healed. The result with the tibia has been excellent. After the shaft was removed, new bone showed to be developing at the end of six weeks and this continued to enlarge until it became as strong as its fellow. The shadows cast by this replacing bone were much less dense than in the other new bones in our series. This we believed was due to the lack of use of the limb, because of the trouble at the hip. The foot bones, which were not diseased, gave a correspondingly light picture, such as is seen in the atrophy of disuse. The wound of the tibia healed very rapidly, and was closed in three weeks after the shaft was removed. During the child's first stay in the hospital, the urine contained much pus, which improved under copious water drinking and changing the acid to an alkaline reaction. On her return home she had several attacks of renal colic and later Dr. Nowlin found severe small calculi which she passed. A picture of the kidney region showed several calculi in the renal pelvis, which were removed under gas anæsthesia January 1, 1914. The child has remained free from pain since, and her urine is without pus.

There have been three cases in which there has been a partial failure of regeneration of bone in the periosteal tube left after excision of the shaft, and in these cases we have subsequently made a transplant of bone with most satisfactory results (Cases 3, 4, and 10). Other operators have had similar failures and various explanations have been offered for this outcome, but the explanation that comes to mind, when reading a report of such a failure, is that the periosteum was removed with the shaft. In these three cases I am certain that this is not the explanation, as I have been most careful at the operations to keep within the periosteum, as, since the failure to regenerate, I have studied the bone specimens that were removed and find no periosteum attached to them. The age factor does not enter, as the oldest was thirteen, the other two being seven and ten respectively, and we have had perfect replacement in children of these various ages. The one factor that seems constant is that of protracted infection in the periosteal tube. Case 3 is a brother of Case 2. The disease developed simultaneously, each in the upper end of the tibia, and the amount of bone destruction in both tibias was apparently the same, and the amount of new-bone formation seemed the same on the X-ray plates. They were operated the same day. The conditions found at operation were the same, and both cases were handled alike except that about two inches more of the tibia had to be removed in Case 3. Case 2 healed *per primam*, while this case suppurated slightly, and discharged for a time rather profusely, but this had about ceased in six weeks, and there was only a small sinus in the upper end of the wound which persisted for two months. There was a thin pencil of bone developed in the periosteum extending from the lower fragment upward about three and one-half inches, but at the upper end of the wound only a little new bone had formed below the epiphysis. It left a gap without bone, which corresponded to the place where the sinus had persisted. In Case 4, the child had been sick for three months when admitted. The X-ray showed a periosteal shadow about one-quarter of an inch in thickness and a sequestrum of the upper two-thirds of the shaft of the tibia. When operating, we found a moderately thickened periosteum with minute bone-flakes, but scattered under the periosteum, between it and the sequestrated shaft, were many small abscesses. The periosteum was molded into a ribbon and sutured with chromic catgut. The whole length of the wound continued to suppurate, and at the end of two and a half months a piece of the chromic catgut was taken from the wound. After that the healing progressed, but a sinus persisted and occasionally the whole upper part of the leg would swell as long as six months after the operation. In the upper part of the defect, new bone showed at the end of three months, about two and a quarter inches long, and at the end of eight months this had not changed any in size, so that a transplant of four and one-half inches of bone from the front of the opposite tibia was made with perfect healing. Four and a half months

after this transplant was inserted, she was walking on the leg (nineteen months after the first operation). Case 10 came to the hospital after a two weeks' illness. Since the second day an abscess over the tibia had been present, with a small stab-wound drainage which had allowed the pus to burrow under the periosteum from the ankle to the tibial tubercle. When an incision was made exposing the bone, the shaft was found denuded of all periosteum. This, together with the infection inside the shaft, had cut off the blood-supply and the shaft was necrotic for its lower two-thirds. After the pus was let out the periosteum was allowed to drop back on the shaft in the hope that new bone might develop in it or that it might again become adherent to the shaft. Adequate drainage was secured with gutta-percha tissue outside the shaft and where the medullary canal was opened. Careful examination with the X-ray showed some periosteal activity after ten weeks, and the shaft was removed and the periosteum treated as advised by Nichols, this time using number two plain catgut, because of one experience with chromic gut in Case 3. There was an abscess behind the shaft about its middle, but except for this the wound was fairly clean. The most active periosteum at the time of operation was in the lower part of the wound, but the only place where new bone developed was in the center of the defect. There was a fairly active discharge for many months. One year after the first operation a bone transplant was made. This healed perfectly and at the end of five months the boy was walking on the limb.

The only explanation I can offer for these failures lies in the presence of long-continued suppuration in the periosteal tube after the shaft has been removed and that this suppuration has destroyed the bone-forming elements. Nichols makes slight mention, as far as I can find, of a failure of the periosteum to develop new bone. Homans mentions one case of incomplete bone regeneration in a case operated by resecting the tibia six days after the acute onset, which later required a transplantation of the fibula, and another case of partial regeneration in a fibula which was operated, according to Nichols' dictum, seven weeks after onset. Stone recounts a failure of regeneration of the tibia and Huntington does also. I know that other operators have not uniformly had complete regeneration of bone after subperiosteal resection. As the literature now begins to show the new method of bone transplantation, we see reports where this was done in cases of osteomyelitis where the shaft was removed and not reformed. The theory of Macewen, that periosteum is only a limiting membrane and has no osteogenetic power and that all diaphyseal bone is reproduced by the proliferation of osteoblasts derived from preëxisting osseous tissue, has been accepted by some, though we are inclined to reject the first part of this contention and to attribute to the periosteum an active function in the bone production. If, however, we do accept this theory, we can explain the failure to complete regeneration in my cases by considering the suppuration after the operation as destructive of the small bone-plates that have been left attached to the periosteum, thus leaving in the center of the periosteal tube no osteoblasts from preëxisting osseous tissue. The new bone developing at the ends of the defect may be explained as arising either from periosteal plates that escaped destruction from infection or as possibly growing from the proliferation of bone-cells derived from the epiphyseal line at one end and the cut end of the shaft at the other.

I will not go into a discussion of the nature of the healing and regeneration of new bone from bone transplants. In these and other cases, we have made use of bone from the same individual taken from the tibia, leaving the periosteum on the transplant. Following the course of the cases after transplanting bone by X-ray pictures taken at regular intervals, we notice that the bone in a few months has lost in density of shadow, and later the shadow is deeper as the bone begins to conform to the size and shape of the shaft which it replaces. An examination of the plates in the cases of transplanted bone shows that there is little evidence of any activity beneath the periosteum, but the shadow which represents the growth of the new bone is from the marrow side of the graft. In Case 3, the

graft, after five months, had undergone a partial absorption, and at one point it appears to be broken with rather wide intervals between the ends. There was no break and the spicule of bone in front of the graft is solid. At the point where the bone appears fractured, the graft was cut thin and had no endosteum left. This part of the graft has clearly not been the skeleton on which new bone has formed, because there is later a bulging of the shadow like the callus about a break. An interesting point is the increased activity of the narrow piece of bone which had developed in the periosteum, after the transplant was laid next to it. It had practically stopped enlarging when the grafting operation was done.

CASE 3. St. Louis Mullanphy Hospital, No. 9,404. C. H., age 10; osteomyelitis of right tibia. (Fig. 4.)

The boy, a brother of Case 2, was admitted to the hospital August 22, 1911, with a history of illness beginning two months before, when the right leg, just below the knee, became painfully tender and swollen. There had been no injury, but there was inability to use the limb because of the pain. which was constant and severe. Three days later a swelling below the knee was lanced. with relief of pain. There was a sinus discharging pus and the upper half of the tibia was thickened. The X-ray picture showed a destruction of the upper five inches of the shaft with a periosteal thickening. Cultures gave a staphylococcus. On September 1, 1911, he was operated and about five and a half inches of a soft and necrotic shaft was removed, leaving the thickened periosteum, which was sutured with a fine catgut to make a ribbon. The skin was closed with catgut. On the fifth day a window was cut in the plaster cast, and the wound dressed. There was a rather free discharge from the wound. An X-ray showed no evidence of new-bone formation. On December 29, 1911, four months after operation, he was admitted to the Children's Hospital, with a sinus persisting at the upper end of the wound, with a rigidity of the tibia throughout part of the defect, but no evidence of bone in the upper part of the wound, where there was motion when the leg was swung laterally. An X-ray picture showed a thin process of bone not more than an eighth of an inch in diameter extending upward four inches from the lower end of the tibia and leaving a gap of two inches just below the epiphysis where there was no new bone. This hiatus corresponded to the part of long-continued suppuration. Four months later he returned for observation with the sinus healed, and an X-ray showed the condition practically unchanged since the previous visit except that the thin process of bone had thickened to about one-quarter inch in diameter; but it was no longer. The epiphysis was tilting forward, which made the gap appear slightly less than before. He was readmitted to the Children's Hospital, where he was operated and bone grafted in the defect. June 18, 1912, nine and a half months after excision of the shaft, with a Gigli saw a piece of bone was removed from the crest of the opposite tibia five and one-half inches long, about one-quarter inch thick, and one inch wide, leaving the periosteum intact. An incision was made beside the long spicule of bone, a mortise made in the under surface of the epiphysis, and a small ledge cut into the end of the lower fragment. The bone-graft was forced into the interval and needed no fixation sutures to hold it in place. The periosteum was turned backward and the wounds were closed. Healing was *per primam* throughout. He left the hospital in six weeks. Up to three months after this operation we thought we could make out slight lateral motion at the joining of the upper end of the graft to the epiphysis, but this was very slight, and in four and a half months he was using his leg without support. On January 1, 1913, he was admitted with a fracture of the right tibia. The break was not through the part where the graft was removed, but a half-inch above the upper part of the channel. A study of the X-ray plates showing the development of the graft is of interest. These were taken every two or three months. Six weeks after the operation we note that that part of the graft above the lower end, where our saw had cut the bone very thin, produces a shadow which is continuous but almost transparent. In five months there appeared to be a fracture at this point, but it is in reality a complete absorption of the bone salts, because the spicule of bone that lay in front of the transplant is continuous; in fact, has increased greatly in size. Furthermore, the leg is now being used for weight-bearing and is perfectly rigid. At the end of eight months the gap still shows, but is almost obliterated, and from now on up to the end of fourteen months there has developed in the gap what might have been termed a callus had there been a break. This bulge is on the periosteal side of the transplant, and this extra building of bone may be considered as due to periosteal activity. The absorbtion may be accounted for by the fact that at this part of the graft there was only hard cortical bone without medulla cells, while the rest of the graft had medulla attached. If the graft is regarded as acting as a scaffold for the development of new bone, then we find the marrow-cells the most vigorous parents in the early stages, the periosteum showing its activity later. This speculation is aside from the issue. The graft developed so rapidly that in less than a year there was new bone equal in size to the rest of the shaft, and subsequently the cells rearranged themselves to give the impression upon studying the plate that a new cortical tube developed with a narrow cavity.

CASE 4. Children's Hospital, No. 2,184. C. L., age 13; osteomyelitis of tibia. (Fig. 5.)

On October 18, 1911, when she was admitted to the hospital, there was a swelling of the lower leg

which had existed for three months. It had been opened two weeks after the onset and has continued discharging pus ever since. On October 30, 1911, the upper two-thirds of the shaft was excised. The shaft was sequestrated and contained many small abscesses. The bone was already separated at the upper epiphysial line. The periosteum, which was quite thick, was carefully preserved and sutured with chromic catgut, and the skin was partially closed. A plaster cast was applied. Her condition rapidly improved, but there was a moderate discharge throughout the length of the wound. At the end of two and a half months the discharge still continued. At this time a large piece of unabsorbed chromic catgut was removed from the wound. There was no evidence of new-bone formation on the radial graft. At the end of seven months the infection had subsided, except for two small sinuses. The X-ray picture shows these to lead to small sequestra. The new-bone formation had been only at the upper end of the wound below the epiphysis. In a short time the wound was healed, but the leg remained useless. Fourteen months after the operation the new bone formed in the periosteal tube is represented by a spicule two inches long extending downward and forward from the epiphysis, and a transplant was considered necessary. On December 31, 1912, this operation was performed. The wound was incised to the depth of the original shaft of the tibia. The fragment of new bone was divided with bone-cutting forceps and bent backward to be in line with the transplant. A cavity was made in the epiphysis to receive the upper end of the transplant and a similar cavity in the end of the lower fragment of the tibia. A transplant four and one-half inches long was taken from the crest of the other tibia with the periosteum attached. This was done with a V-shaped gauge one-half inch from the crest of the bone, and lifting the graft off with a double wedge forceps after either end had been marked with a saw. The graft was inserted in the bed prepared for it and the wounds closed. The graft healed in perfectly, and without reaction. At the end of ten days she was walking about the ward, and four months after the operation was using the grafted leg with the support of a light brace. The bone developed from this transplant at the end of a year was the same size as the rest of the shaft, and the leg gives the appearance of never having been diseased.

SUMMARY

Diagnosis. The earliest symptom of osteomyelitis is pain in the shaft of the long bone (usually near the end), accompanying septic symptoms. In a few cases of profound sepsis, pain sense is lost. Soon there is swelling of the shaft near the joint, frequently at the epiphyseal line. At this stage the joint is not involved. Septic arthritis usually is an intense infection, with less pain and several joints involved. Tuberculosis is a chronic disease that involves the epiphysis, and syphilis may give a similar picture. The X-ray is of great value, except at onset of the infection.

Treatment. The treatment in the acute stage is to drain to the center of the medulla by removing a narrow channel of bone along one side of the shaft. Gutta-percha tissue is used to drain this channel. The medulla should never be "cleaned out," as it is needed for the endosteal regeneration.

In the subacute or chronic stage of osteomyelitis of the femur or humerus, treatment is planned to allow the shaft to heal after efficient and sufficient drainage. If sequestra have formed, these are removed, and the cavity wiped out with gauze. It is best not to curette these cavities or to attempt to sterilize with antiseptics. The iodoform beeswax of Mosetig-Moorhof is introduced into the cavity to act as a drain, which is partially absorbed and partially extruded. Gauze should never be used as a drain in either the acute or chronic stage. Where one bone of the forearm or leg is involved (and at times the humerus), the treatment suggested by Nichols is followed. The shaft is removed subperiosteally about five or six weeks after draining the acute infection. The periosteum at this time should show a sufficient thickening to cast a shadow on the X-ray plate. After removing the shaft the periosteum is sutured into a ribbon joining the ends of the remaining bone, and from this periosteum new bone is formed to replace the diseased shaft. In the meantime the other bone supports the limb in its proper position. In about four months the new bone can support weight. The forearm can be useful in less time.

In a small proportion of badly infected cases, bone does not regenerate completely after removal of the shaft, and bone transplantation has to be resorted to after healing is obtained.

Chronic localized osteomyelitis cavities in the cancellous bone may be treated by healing under blood-clot, or drainage with Mosetig-Moorhof wax, after the bone detritus has been removed with rongeur and gauze.

NOTE.—Owing to the lack of space the table of cases has been omitted.

PYLORECTOMY AND PARTIAL GASTRECTOMY OR EXCISION OF THE ULCER-BEARING AREA IN THE TREATMENT OF GASTRIC ULCER[1]

By WILLIAM L. RODMAN, M.D., LL.D., F.A.C.S., Philadelphia

FOURTEEN years ago, in a paper before the American Surgical Association, I advocated a more radical treatment of gastric ulcer than had been hitherto practiced. I was led to do so, not from theoretic considerations alone, but after a careful study of the few cases published, and others reported to me in an extensive correspondence with American and foreign surgeons, giving the clinical result following partial gastrectomy and pylorectomy. Nearly all of the forty patients so treated had been operated upon with the belief that they were *suffering from cancer*, and hence demanded more radical measures than pyloroplasty and gastro-enterostomy, then so much in vogue in the surgical treatment of ulcer. It was also ascertained not only that the more formidable procedures of partial gastrectomy and pylorectomy had been followed by far better clinical results, but that the operative mortality was little if any more (15 per cent) than the acknowledged risk inherent to pyloroplasty and gastro-enterostomy at that time. Nevertheless, I felt that partial gastrectomy and pylorectomy, especially the latter, might yield a heavier mortality than either pyloroplasty or gastro-enterostomy, and that the favorable showing then made for the more radical measures was, perhaps, fortuitous, or due to the fact that the surgeon was more ready to report successful instances of a new operation than unsuccessful ones. But this much was reasonably certain: radical treatment, or excision of gastric ulcers, did prevent subsequent hæmorrhage, perforation, subphrenic abscess, hour-glass stomach, and malignant degeneration, while neither pyloroplasty nor gastro-enterostomy assuredly prevented any of them. Therefore an operation which gave assurance against such future disasters, and which, moreover, left the stomach in a much better condition for the performance of its normal functions, had a claim for consideration, even though its mortality were far greater than the uncertain, and oftentimes at most, palliative procedures. It was later made apparent that pyloroplasty gave such unsatisfactory results, operative and clinical, that it fell into general disfavor and has hardly been heard of in the past ten years. I refer, of course, to the Heineke-Mickulicz operation, which was so generally practiced between 1895 and 1905. The operation of Finney, however, introduced in 1902, and based upon sounder physiological, pathological, and surgical grounds, has not only maintained its place, but has grown in favor and seems particularly applicable in the treatment of duodenal ulcers.

That gastro-enterostomy was not, for many years at least, followed by the best operative and clinical results is only too clearly evidenced by the many changes made necessary in its technique: they are too numerous to mention. The most that can be said at this time is that surgeons very generally prefer the posterior to the anterior anastomosis and that the long loop of twelve or more inches has been gradually shortened on account of regurgitant vomiting until there is usually no loop at all. Mechanical devices have been abandoned for direct suture, but the method of approximating the stomach and jejunum, the length of the opening between them, and the many nicer points of detail vary widely with different operators.

Every one, from the time gastro-enterostomy was first practiced, has been made to observe that patients with a closed or partially closed pylorus do better than those in whom it has been left patent; and yet, notwithstanding the many operative procedures to secure pyloric exclusion, none of them has yielded entirely satisfactory results. A majority of the one hundred surgeons communicated with and expressing themselves upon this point withhold their approval of the prin-

[1] Read before the American Surgical Association, New York, April 9, 1914.

ciple; others speak pessimistically of the clinical results in the cases which they have observed, while still others commend the principle but do not believe that a satisfactory method has yet been discovered.

After carefully reviewing the statistics recently furnished me, I am impressed with three things: First, that the operative mortality following gastro-enterostomy has not been less than 5 per cent; second, that the end results are frequently disappointing to the surgeon and disastrous to the patient, making his second estate worse than his first. Third, that a number of perfectly satisfactory gastro-jejunostomies from an operative point of view, the patients remaining well for a year or longer after operation, were followed by malignant disease and death. As one of the members of this Association expressed it, "Two-thirds of the patients who survive the operation are cured, one-sixth are bettered, while the remaining one-sixth are rank failures, no better, perhaps worse, than before operation". Some of the supposed ulcers may have already undergone cancerization before the gastro-enterostomy, but in others the evidence of malignancy was postponed several years. This factor was emphatically brought out in the reports of Gerster, Mayo, Lilienthal, Robson, and many others.

Gerster writes me as follows: "Gastro-enterostomy in ulcers yielded to me on the whole good results — very good operative results; but there were a number of clinical failures due to the development of cancer in the ulcers. Resection of the ulcer-bearing area is the ideal method of treatment and should be applied wherever topographic and technical considerations do not forbid."

Dr. Lilienthal writes: "Gastro-enterostomy in its various forms does not give me satisfaction, and in three cases which I happen to remember just now carcinoma developed at the pylorus years after the gastro-enterostomy; in two cases the stoma closed. I do not approve of the various exclusion methods and can prove by X-ray studies that in many of these cases patency is re-established."

William J. Mayo, our distinguished president, wrote me as follows in 1908: "The main field for the Rodman operation as we find it, is an inability at the operating table to tell a carcinoma from an ulcer. In three cases out of four when we remove a suspicious ulcer it proves to be a carcinoma, and a number of cases after gastro-enterostomy for supposed ulcer have developed carcinoma so quickly as to make it almost certain that it had existed at the time of operation." Only a few days since I sent him the above quotation from his former letter asking his permission to use it again, or, if he wished, to revise it so as to make it conform to his present views and practice. He replied that he had no change to make, as it was just as true today as when it was written.

Have we not, in the above expressed views and practice, the only explanation of the remarkable results achieved at the Rochester clinic in both ulcer and carcinoma of the stomach? At no other clinic in the world have their results been approached in the treatment of the latter affection, showing 25 per cent of five-year cures and 36 plus per cent of three-year cures. Such results would not be possible if only lesions macroscopically cancerous were considered.

On account of the number of carcinomata following gastric ulcers in his practice (59.3 per cent), Mayo-Robson, one of the earliest and ablest exponents of gastric surgery, said in 1904 that "excision of the ulcer-bearing area must be more frequently done in the future." Furthermore, of 112 posterior gastro-enterostomies performed by Mayo-Robson for ulcer, four patients died subsequently of carcinoma. It developed in one patient at the end of a year after a perfectly successful gastro-enterostomy; in one, after two and one-fourth years; in another, after two and one-half years, and in the fourth after three and one-half years. All enjoyed good health between the gastro-enterostomy and the onset of cancer symptoms. The time intervening renders it unlikely that a mistake in diagnosis could have been made in any but the first case. There are other cases in this series where it seems more than probable that death was due to cancer.

Bevan of Chicago informs me that he has performed about a dozen pylorectomies for

ulcer where a laparotomy diagnosis of probable carcinoma was made; although all the patients recovered, he believes the more radical procedure should be reserved for the worst cases and then perhaps performed in two stages. He has found gastro-enterostomy, on the whole, satisfactory in the treatment of gastric and duodenal ulcers, but has excised both with good results.

The following communication was received from George Emerson Brewer: "In reply to your note I can say that I have never done a pylorectomy for benign ulcer. I thoroughly approve of your suggestion and teach it. I have a number of times done a pylorectomy for an induration following an ulcer history, but in every instance the growth was found to be malignant. In only one instance have I removed a large saddle ulcer of the lesser curvature. This case gave us a very satisfactory result. During the past six weeks I have had two cases in which I expected to do an excision, thinking the growth was benign. In one instance it was inoperable and found to be syphilitic, and in the other carcinoma."

R. C. Coffey of Portland, who has done much operative and experimental work in the upper abdomen, says: "Concerning gastric ulcers, I will state that I am doing the Rodman operation more frequently all the time; have done two within the past month. I believe I have done something like ten previous operations, making twelve, with one death. I have now reached the rather definite conclusion that when a patient is in good condition and the ulcer is near the pylorus, either in the duodenum or stomach, and has not perforated, or adhered to the head of the pancreas, I do pylorectomy. If there has been a duodenal perforation and the duodenum has adhered to the head of the pancreas, I do von Eiselsberg's unilateral exclusion. I think McCarthy's recent paper in the February *Archives of Internal Medicine* is more convincing still that we should remove an ulcer when possible."

There are many others from whom I could quote, all to the same effect. We have shown, I think, that even the most experienced surgeons cannot make an accurate diagnosis in chronic gastric lesions. That this difficulty will assuredly be increased in hosts who have reached, or passed middle age, the time when both ulcer and cancer are most common, cannot be questioned. Is it not, therefore, true conservatism to take into consideration potential dangers, such as hæmorrhage, perforation, subphrenic abscess, disabling adhesions, and, greatest of all, cancerous implantation upon the base of the ulcer, and to anticipate and prevent all by a radical operation, instead of doing one which may at most prove palliative, and that for a time only? The only way to view this difficulty, it seems to me, is to ascertain if a radical operation, which removes the lesion, can be instituted with less risk to the patient than that which is inseparable from the disease itself. In chronic ulcers there would seem to be no difficulty in answering this question, as a conservative estimate of the mortality following medical treatment, and admitted by medical authorities, is not less than 25 per cent. If we separate excisions and pylorectomies we find that the former yield a mortality of 1.75 per cent, (171 operations, 3 deaths) which is less than that following gastro-enterostomy. Two hundred and five pylorectomies were followed by 18 deaths, or 8.7 per cent. It must be remembered that these statistics include all operations reported during the past fifteen years and represent the experience of many surgeons, some of whom have done very few operations. In 376 radical operations performed by all of the surgeons communicated with, the mortality was 5.6 per cent, or less than that from hæmorrhage alone, and one-half that following perforation, not to mention the additional risks of subphrenic abscess, disabling adhesions resulting in hour-glass stomach, and that indefinite, intangible, but ever increasing danger, malignant degeneration of the ulcer. So frequent is the last mentioned complication that it would seem now the duty of the surgeon to remove the lesion when it is practicable and does not entail too great operative risk, for a considerable majority of those communicated with have expressed themselves most positively upon this point.

Furthermore, we should realize that the

most recent and trustworthy statistics[1] show that there are 75,000 deaths from cancer in the United States annually; that 35 per cent, or more than 26,000, are caused by carcinoma of the stomach (Virchow), and, moreover, that those surgeons most experienced in gastric surgery have reported, after accurate clinical and microscopical observations made at their respective clinics, that a percentage varying from 59.3 (Mayo-Robson) to 71 per cent (W. J. and C. H. Mayo) of gastric carcinomata are preceded by ulcer.

Sir Berkeley Moynihan, who was my guest in 1903, did not hesitate to tell me plainly, a trait so characteristic and admirable in the English, that I greatly overestimated the frequency of carcinomatous changes in gastric ulcers, had so changed his views within the next five years as to publish in 1908 that 72.1 per cent of the operations he had recently done for gastric cancer had been preceded by a well-marked history of ulcer varying from 3 to 26 years. The observations of Moynihan and Mayo-Robson astute clinicians as they are, are entitled to much weight, though unsupported by microscopical examination.

No one who has visited the clinic at Rochester, a privilege I have many times enjoyed during the past fifteen years, has left there without being impressed with one fact—that pathology is used, as it should be, as the true handmaiden to surgery. Every tumor or lesion removed is at once examined by competent microscopists and an immediate report made to the operator and onlookers. Moreover, the frozen section reports are later confirmed by serial sections. In this way, and in this way only, in my opinion, will the patient get that to which he is entitled. The time for guessing has passed, as we have already shown that the most experienced men confess their inability to make an accurate diagnosis, even when the lesion is inspected, palpated, and scrutinized from every viewpoint. The presence of enlarged lymphatic glands does not necessarily mean cancer, as they may be inflammatory, and the absence of such involvement most certainly cannot rightly be construed as always, or usually, indicating a benign process, and to await positive evidence of cancer is to allow the propitious time for surgery to pass. The microscope, and it only, can tell what pathological changes have occurred, and the patient has a right to insist that his surgeon avail himself of every means at his command to obtain accurate information at the time of operation, so that the right procedure can be instituted, and that *he*, as well as others, may profit thereby. That too many patients with potential or actual cancerous lesions in the stomach, breast, gall-bladder, intestines, prostate, and other organs pay the price of involuntary sacrifice to incomplete surgery cannot be questioned.

It would seem clear that more radical measures than hitherto usually practiced should be employed, so that cancer in its early stages may be cured, or better, prevented altogether. Never at any time in the world's history has the cancer menace been so generally appreciated as now; never has there been such intelligent coöperation between the medical profession, philanthropists, and the laity to discover its cause; and never certainly have surgeons been so stimulated and quickened to act promptly themselves and to urge medical confreres to do likewise in combating this scourge. But recognizing, as all do, the strictly local nature of carcinoma primarily, and as well the desirability of acting during the precancerous stage when considering the breast, lip, tongue, gall-bladder, intestines, prostate, etc., there does not seem to be so keen nor so general an appreciation of the frequency of gastric cancer, nor of its close association with ulcer as an etiologic factor. And yet both facts have been proclaimed from the very housetops by clinicians and pathologists. We have already mentioned the former, and it is only necessary to refer to the work of Cruveilhier (1839), Dittrich (1848), Rokitansky (1849), Hauser (1903), Futterer (1892), Ssapeshko (1902), Stich (1903), Oettinger (1903), Jeddlicka (1904), and a host of others, such as Zenker, Klausa, Sonnichen, and Schmincke, to show that a percentage of gastric carcinomata varying from 26.6 (Jeddlicka) to 90 per cent (Ssapeshko) give positive microscopic evidence of having been preceded by ulcer. One

[1] Hoffman, statistician of the Prudential Insurance Company.

of the number (Jeddlicka) also made clear from pathological investigation in 1904 what I had believed in 1900, from the scant clinical evidence then forthcoming, that gastric ulcers in other parts of the organ than the pylorus and its proximity do not undergo cancerization. He says: "It should be noted that all the ulcer-carcinomas were encountered in the pylorus, whereas ulcers situated in other portions of the stomach, and which were examined, did not reveal a single carcinoma." In 1905 I encountered one patient with ulcer-carcinoma in the middle of the stomach and found a similar case reported by Cackovic. Both have been reported and others have doubtless occurred. It is, however, reasonably certain that ulcers in the larger and more expanded four-fifths of the stomach are not only very much less frequent, comprising, as they do, only 20 per cent of the total number of gastric ulcers, but rarely undergo malignant change. Eighty per cent of all ulcers are found in the pyloric fifth. The greater irritation to which ulcers at the pylorus or in the pyloric antrum are subjected and the forcible impact of the large amount of acid chyme upon them during digestion would seem to furnish adequate reason why they are so prone to undergo cancerization. They, too, are more likely to be followed by perforation and hæmorrhage, and when the latter occurs, on account of the large vessels in this situation, it is apt to be severe. Therefore a more radical treatment of such ulcers is called for, and pylorectomy, which removes largely the ulcer-bearing area, is the operation of choice, provided that the pyloric end of the stomach can be easily mobilized and the patient is in good condition.

It is questionable if it should be done in the presence of acute perforation or severe hæmorrhage. Many of the fatalities reported have been due to too radical surgery in spite of these grave complications. I have only once undertaken pylorectomy for a large acute perforation on the anterior wall of the pylorus, which occurred just after a hearty luncheon. The escape of gastric contents was marked, as the opening was large and ragged. My patient was a robust young man of twenty-two, and as the sutures would not hold because of the necrotic tissue around the perforation, resection of the pyloric end of the stomach, supplemented with a posterior gastrojejunostomy, was done as a *dernier ressort*. I have never had a patient do better in every way even after simple gastro-enterostomy. I have also performed pylorectomy after there had been moderate chronic hæmorrhages, but I should hesitate to do so in the presence of even moderate acute hæmorrhage, and would not do so at all during a severe hæmorrhage or the ensuing shock. In such circumstances I have for the past twelve years depended upon morphia and atropia hypodermatically, and very hot water, 130°, cautiously introduced through a tube.

I was led to do this first in 1902 after the most severe and repeated gastrorrhagias I had ever witnessed. The patient was pulseless, delirious, and exsanguinated to such a degree that recovery seemed impossible. I did not believe a human being could lose so much blood and live. The room in which she lay resembled an *abattoir*. The night superintendent, the nurses, and my assistant were covered with blood when I arrived. Before I came my assistant, Dr. S. C. Burns, had given morphia, ice, and astringents of every description without result. In my desperation eight ounces of hot water was introduced through a stomach tube. We both remained in the hospital all night and one of us was constantly on watch. The vomiting and bleeding were immediately checked by the hot water. It has never failed me and I have used it in about 20 cases. Dr. W. H. Thomas, one of my assistants, has had a similar experience and has recently reported his cases.

Within a fortnight I saw a young man 32 years of age with Dr. Paul R. Correll, who estimated that his patient had lost eight pints of blood through vomiting; he subsequently lost considerably more by the bowels, and he was pulseless when I saw him. He never vomited after he was given hot water, and was removed to the hospital, where he is now improving rapidly and being prepared for operation.

CONCLUSIONS

1. If the ulcer, or ulcers, are situated at or near the pylorus, as they are in about 80 per

cent of all cases, and the pyloric end of the stomach and proximal portion of the duodenum can be easily mobilized, pylorectomy, which gets rid of the existing ulcers, and prevents future ones to a large extent, removing, as it does, four-fifths of the ulcer-bearing area, is certainly the operation of choice. The frequency with which hæmorrhage, perforation, and cancer, especially the latter, follow gastro-enterostomy, show it to be wholly inadequate. Moreover, the radical operations of excision and pylorectomy are only slightly more dangerous while far more beneficent in every way than gastro-enterostomy.

2. If, however, the converse obtains, the stomach and duodenum being bound down by adhesions to adjacent viscera, such as the pancreas, liver, gall-bladder, transverse colon, etc., simple gastro-enterostomy, the anastomosis being made about the middle of the stomach, should be practiced. If the symptoms are not relieved within a reasonable time, then pylorectomy may be performed more safely. Before such a step is taken the operator should be assured that the gastro-enterostomy is patent and functionating.

3. The operation can also be done in two stages in those patients not in good condition, whether it be from hæmorrhage, anæsthetic, or other cause. It is often best to perform pylorectomy for cancer in two stages, and practically the same is true in ulcer operations, but it will be much less frequently the case.

4. Gastric ulcers, duodenal as well, are more frequently multiple than is appreciated; some excellent authorities state that such is usually the case. With the number and chronicity of ulcers potential dangers are increased, and radical measures are more urgently called for.

5. Ulcers away from the pyloric end, that is, occupying the expanded four-fifths of the stomach, should preferably be treated by partial gastrectomy or removal of the ulcerated area. Although such ulcers rarely undergo cancerization, they frequently bleed and perforate, both of which dangers are increased by the freer movements of this portion of the stomach during respiration. Moreover, on this account protective adhesions are less apt to form about them, if we except the lesser curvature, which is relatively immobile. If simple excision is practicable, it should be done, as it produces a smaller mortality (1.7 per cent) than gastro-enterostomy.

6. In some cases it may be wise, though it is not usually so, to supplement excision by gastrojejunostomy. It all depends upon the location and size of the ulcer and whether or not the stomach can presumably carry on its functions without irritating, stretching, or otherwise interfering with the line of suture.

TRANSPLANTATION OF OVARIES[1]

By PROFESSOR THEODORE TUFFIER, Paris, France

MY purpose in addressing you on this subject is to lay before you my experience in grafting ovaries in the hope that menstruation might be preserved after operations for salpingitis and fibroids of the uterus. During the past eight years, from November 15, 1906, to July 15, 1914, I have performed two hundred and four operations, thirty-five of which cannot be considered in this paper as they were performed only recently. These operations were not all of equal importance.

HOMOGRAFTING

Homografting, or the transplantation of ovaries from one patient to another, I have performed twenty-four times under the most favorable circumstances, but it did not prove successful. I have performed seven heterografting immediately after the removal of an ovary or after the gland had been preserved in cold storage from one hour to forty-four days, and the operation has never given me a single functional result. I have transplanted an ovary from one young woman to another

[1] Read before the Clinical Congress of Surgeons of North America, London, July 28, 1914.

who presented, after the removal of ovaries and tubes, very severe symptoms simulating change of life. There was every chance of success, for the patients were of the same age, of the same complexion, and had the same color hair. I should have been successful, but the blood of the patients was either hæmolyzed or agglutinated on coming in contact. The disturbances were the same after as before the transplantation, the patients had all the symptoms of menopause, and after some months the ovary gradually decreased in size.

I think, however, that with an improvement in technique we may later succeed in this procedure, because the mechanism of absorption in such cases is well known. It is the same as for any foreign element — the foreign element being destroyed by the macrocytes. If we could prevent the macrocytes from attacking the grafted ovaries, it would be possible to obtain success. We already have learned from Carrel's experiments that the transplantation of limbs always gives a better result when the animal is infected. It is probable that the macrocytes in infected cases are occupied in struggling with the microbes and, consequently, are unable to attack the grafted limb. While it is not within the province of surgery to produce infection in the human body, we do hope that some chemical substance will be discovered that may be used to protect the grafted ovary from an attack by the macrocytes.

AUTOGRAFTING

The most interesting operations are those for autografting — the process of grafting a woman's ovary in her own body. I have performed one hundred and forty-five of these operations. Two circumstances under which the operations were performed may be cited: First, total hysterectomy and transplantation of one or both ovaries, in whole or in part. Eighty-four operations were performed in this way. The graft takes, and every month it increases in size. This continues for two or three years, but without any benefit to the patient. Second, in salpingitis I leave the uterus in place, remove the two adnexa, and then graft either one or both ovaries. Sixty-five operations have been performed following this technique.

In discussing the subject of grafting ovaries in a part of the body, retaining the uterus in its position, I would call attention to the following points:

1. Justification for this operation.
2. Surgical technique.
3. Results.
4. Indications and future possibilities.

1. JUSTIFICATION FOR THIS OPERATION

Leaving the uterus in place when transplanting the ovaries has for its object the suppression of pain and the preservation of menstruation. My results, already published, with respect to the congestive, trophic, and nervous accidents in young women after the suppression of menstruation, are all well known. These symptoms persist for a very long time and are often severe, but if the patients could be spared such trials by undergoing a slight and efficacious operation, they would be benefited greatly.

2. SURGICAL TECHNIQUE

After salpingectomy, the ovary may be left in the abdomen if necessary, or it may be grafted near the uterus, or in some other place, as under the skin of the abdominal wall. I have now abandoned these methods because after operation, the patients very often complain of pain, and a second laparotomy or a new section is necessary to remove the ovaries. However, in certain cases of tubal disease without general pelvic inflammation, the ovaries may be left in place successfully. Two of my patients who were operated upon ten and five years ago, respectively, are now in very good condition. I prefer the following technique:

In a case of chronic salpingitis, the abdomen is opened and all the adhesions are broken up. I hold in my fingers the ovary and tube. The gland is isolated with forceps and the pedicle cut. I take the ovary in a sterilized compress, the peritoneum of the abdominal wall is separated by the finger deeply inserted into the adipose tissue, and the ovary put into this opening and left there. I remove the tube and secure the bleeding edge of the broad

ligament, after which the peritoneum is completely closed by a continued suture with a curved needle and fine catgut. This point is particularly important since it insures the future mobility of the uterus and restores the broad ligament to its normal state. The abdominal wall is closed with three rows of stitches after I have ascertained that the ovaries are still in place and are without blood around them.

Certain points in the procedure should be understood and I will endeavor to explain them. When the glands are surrounded by adhesions, they are very often torn in freeing them, their surface becomes irregular, and they appear wasted. Often, also, they are sclerosed or contain cysts, but even in such instances the glands may be made use of and the results are good. If the glands are not quite aseptic, they may be dipped into tincture of iodine or passed through the flame of a lamp. The result in these cases is not so good, the majority of patients not menstruating for a long time. In cases of cystic change the ovaries must be opened before grafting. These ovaries, however, have always given good results. A small section of the pedicle of the gland is sometimes needed to enlarge the surface for future adhesions. In some recent cases the glands were divided into equal parts and implanted separately. This is done in order to obtain the smaller grafts and larger surfaces for adhesions.

3. RESULTS

I shall explain successively the (a) clinical, (b) anatomical, and (c) physiological results.

(a) *Clinical.* After the transplantation, where the uterus is left in place, the ovary remains unaltered for three or four months and seems to lie dormant. Sometimes it is a little tender, and the patient has all the symptoms of change of life. But after a while the ovary becomes active, enlarges, and is sometimes painful for five or six days, whereupon all symptoms subside and menstruation reappears. Generally the congestion of the ovary precedes menstruation by five or ten days. On the same day when menstruation has commenced all the symptoms of menopause disappear entirely. After a month or so ovulation again takes place. It is certain that with the grafting of an ovary the normal condition of the patient can be maintained.

This operation presents no more danger than does classical hysterectomy. Of the sixty-five patients upon whom I performed autografting operations without hysterectomy I have interviewed thirty-seven from one to six years after operation, and thirty-two had their periods regularly. In the five cases which did not have regular periods, two important points were noticed; first, the patients were either more than forty years old, or second, they were septic cases where it was necessary for me to dip the graft into tincture of iodine.

Number of months between the operation and the first menstruation:

2 months	2 cases	6 months	7 cases
3 months	7 cases	8 months	1 case
4 months	7 cases	13 months	1 case
5 months	4 cases		

Number of months between the operation and the last medical examination, in women who are still menstruating:

56 months	1 case	19 months	1 case
43 months	1 case	18 months	2 cases
38 months	1 case	17 months	2 cases
37 months	1 case	14 months	1 case
32 months	1 case	13 months	1 case
31 months	1 case	12 months	1 case
29 months	1 case	11 months	1 case
24 months	1 case	10 months	1 case
23 months	1 case	7 months	1 case

Number of months between the operation and the menopause:

30 months	1 case	23 months	1 case
24 months	1 case	13 months	2 cases

From the above it is noted that certain patients have the change of life sometimes from one to three years after the operation. The new condition of the life of the ovaries explains this fact.

One patient menstruated but once; one patient menstruated but twice; one patient menstruated only four times; two patients had severe catamenial hæmorrhages requiring curettage; one patient had severe catamenial hæmorrhages but did not require curettage; one patient had regular periods but every two months only; one patient had irregular periods being sometimes three months without any hæmorrhages.

These cases prove that sometimes the monthly flow is irregular.

Course following operation: After the removal of the tubes, the infection of the organs and the pain are overcome, provided the operation is performed under favorable circumstances and with good technique. By vaginal examination the uterus is found not painful and is quite free. Before menstruation the side of the grafted ovary remains tender for some days — four of our cases were quite painful. It is to be noted that the flow is profuse or less profuse than it was previous to operation, but in most instances it is increased.

Included in my reports are some cases which I would not graft now. These were (1) three women aged 40, 41, and 42 years respectively, who suffered from the engrafted ovaries although they presented all the symptoms of change of life; (2) two septic cases, 20 and 23 years old respectively, which proved unsuccessful because the ovaries had previously been passed through the flame of a lamp.

The results are the same whether one or two ovaries are grafted. I have done twenty-eight autografts of both ovaries and have interviewed later twenty of these patients, nineteen of whom had regular menstruation. I have done thirty-seven autografts of one ovary, and from this series seventeen patients came to see me again and thirteen had regular periods. Of those having amenorrhœa, one was over forty years old.

It is possible that our results may be open to question since when even a small part of the gland is left inside the abdomen, menstruation can be reëstablished and this result is attributed to the grafted ovary. This mistake can be avoided by observing the following factors: When menstruation is dependent on a part of the ovary left in the abdomen, (1) it appears two months after the operation, and I have never seen such a quick result from a graft; (2) the grafted ovary does not become enlarged just preceding menstruation, and it is curious to note that every time one ovary has been grafted and the other left in the abdomen, the graft never produces menstruation.

(b) *Anatomical.* Are the grafted ovaries the real cause of this menstruation? I will give some anatomical proofs. Through experimentation and the examination of transplants, I have been able to establish the anatomical condition of the glands grafted. I will leave the experimental, unfinished part, and will explain the macroscopical and microscopical findings in human ovaries removed two to three years after they were transplanted.

Maney. Age 29, transplant removed after four and one-half years. Macroscopically, a corpus luteum is found.

Mainy. Age 28, transplant removed after three years contained a cyst the size of a nut; the veins and two arteries were the size of the finger. On microscopic examination we find the connective tissue divided into two parts; the external part is very thick, containing many vessels, the internal part not so thick but with many small vessels. The epithelial zone consists of variable cells. It may be said that the specimen is a blood-cyst which has developed from a corpus luteum.

Coffins. Age 24, transplant removed two years after regular menstrual flow had been established. The specimen contained a cyst in which two parts were seen. The external part consisted of fibroid tissue; the internal of connective tissue. The epithelial zone was regular except where small hæmorrhages were found. The cyst had developed from a graafian follicle.

Priolet. Age 44, transplant removed after three years. Fibroid degeneration.

(c) *Physiological deductions.* My operations, by giving me the opportunity of learning that the ovaries become congested from five to twelve days before catamenial flow, prove that this period of congestion is longer than it was hitherto thought to be.

The engrafted ovary passes through two phases. The first phase is very long, lasting from four to six months, during which the function of the organ is not in evidence. Then comes the second phase during which the ovary passes through regular monthly congestive periods — a proof of good vitality. If menstruation does not appear, the patient exhibits signs and symptoms of the menopause. We may conclude, therefore, that monthly ovulation alone cannot prevent the menopausal distress in contradiction to the classical opinion held up to the present time. From this I conclude that ovulation and the internal secretion are not so important as is generally believed. The real cause of the symptoms lies in the suppression of menstruation, the proof of which is the fact that as

soon as the patients have a return of the monthly period, all the symptoms of change of life disappear. Moreover, if the flow stops for one month then the above-mentioned troubles come back.

From all these facts I am able to deduce a new theory of menstruation: I believe that every month the female creates, by internal secretion, a chemical substance; when this substance exists in the blood in sufficient quantity it acts on the ovary, which modifies it, and menstruation is consequently produced by this modified internal secretion and the secretion is eliminated with the flow. I have been able to localize this chemical substance in the blood. It exists in the serum, because I can produce menstruation by injecting defibrinated blood.

If menstruation does not occur, then the chemical substance is retained in the circulation and causes an auto-intoxication which we call the troubles of the surgical change of life. I can give proof for this theory: The blood of a woman immediately before menstruation contains the chemical substance which brings on menstruation — a statement proved by the fact that if blood taken from a patient just before menstruation is injected into the veins of a patient who is between two periods, or whose period is delayed, this injection immediately causes the menstrual flow to appear. I have carried out two experiments which confirm this assertion.

1. A woman, age 32, had not menstruated for two years after her last confinement. After injection of 24 ccm. of serum taken from another patient on the day before menstruation, the patient's menstrual period returned and has been regular for three months.

2. A woman, age 48, was at the beginning of the natural change of life and was suffering with nervous disorders. Thirty ccm. of defibrinated blood, taken from a woman twenty-four hours before her menstrual period, was injected. Four days after the injection, menstruation came on and all the symptoms of change of life disappeared.

We might go still farther in this matter of the conservation of the ovary. If several deductions may be drawn from the results of grafting ovaries, another scientific one is still possible; I mean the resection of a part of the body of the uterus without causing change of life. What is the quantity of mucosa required by the uterus to preserve menstruation? It is yet mathematically impossible to answer this question, but my own experience in two such cases permits me to say that with the engrafted ovaries a destruction of a third part of the uterine body is not sufficient to suppress the physiological hæmorrhage.

4. INDICATIONS AND FUTURE POSSIBILITIES

Must one do a transplantation in every case of salpingitis? All recent cases and all malignant diseases contra-indicate the procedure. After the fortieth year it is also unnecessary. Another local contra-indication exists in cases where strong adhesions are present between the ovaries and pelvis. In these cases, if the uterus is not removed, the patient always complains of pain in the lower abdominal region. With these exceptions, I can say that I am sure that my operation is a good one. Preservation of menstruation in young and very nervous women must be preserved and especially in those suffering from hyperthyroidism, as these patients often exhibit nervous and congestive troubles.

Ovulation without menstruation is, as I have explained, altogether useless. Improvement in heterografting is the most desirable advance at present. In closing it should be stated that where the uterus is absent, ovarian transplantation is of no value.

GOITER IN CHILDREN[1]

By COLEMAN G. BUFORD, M.D., Chicago
Assistant Professor of Clinical Surgery, Rush Medical College; Professor of Surgery, Chicago Policlinic; Surgeon, Children's Memorial Hospital

WHEN one undertakes the study of the goiter question he must first clearly understand that the term goiter refers only to local or general enlargement of the thyroid gland and that such enlargements represent numerous and varied structural changes in the gland, comprising physiologic and pathologic swellings, colloid collections, cystic degenerations, fœtal adenomatous states, benign and malignant neoplasms, and that a number of these processes may occur simultaneously in the same gland. It is therefore apparent that in every case a diagnosis should be attempted so that one may individualize in his treatment.

In discussing this subject I shall limit myself as far as possible to my own observations in and about Chicago. I do so because I have the impression that some prominent phases of goiter vary in different communities and that by relating our own experiences and observations we shall help others in their work rather than confuse them. I shall not endeavor to cover all of the diseases of the thyroid gland occurring in childhood, but shall dwell only upon the frequent types of goiter of children seen in this community.

As we study the goiter question as a whole, certain features of goiter of childhood are worthy of notice. For the sake of simplicity, also because of some variance in the types of goiter at different stages of child life, I shall discuss the subject under the headings of:

1. Goiter of infancy (under one year of age.)
2. Goiter of childhood (from one year of age to adolescence.)
3. Goiter of adolescence

Goiter of the new-born occurs associated with cretinism or as an independent affection; but since cretinism is rarely recognized before the fifth month I fancy that goiters of moderate size in newly born cretins are usually overlooked. I have never seen a goiter in a cretin under six months of age and have found no definite reference to goiter being frequently present before the recognition of cretinism. When they co-exist at any age there is no uniformity in size, shape, or pathologic characteristics. About 90 per cent of older cretins also show goiter, and this is pretty generally looked upon as a glandular hypertrophy or more advanced changes resulting from hypertrophy. That the primary enlargement is due to hypertrophy is borne out by our knowledge of deficient secretion and the law of compensation and through the fact that many of the glands greatly diminish in size upon thyroid feeding. The late Dr. Walter Christopher showed me a bright little girl whom he had brought out of cretinism through thyroid feeding. Each time her feeding was stopped she reverted to cretinism and developed a goiter, which was not present when on thyroid feeding, The question may well be raised as to whether physiologic or artificial compensation ever tide patients over to a period when the needed secretion is physiologically provided. This probably does not often occur, because there is congenital absence of the gland in some cases and irreparable damage to it in others. It is possible that in some the gland is delayed in development and in the performance of its function, and when not fed thyroid, or if its administration is too long delayed, these children may be permanently damaged. This possibility is supported by the following observations: a few years ago I saw with Dr. Kaa of Stockton, Illinois, a patient then about eighteen months old, a typical cretin. After a few months of thyroid feeding the child showed marked mental and physical improvement. Without further feeding he is now said to be a bright and normal boy. In addition to thyroid feeding surgeons must continue in th ir efforts at thyroid grafting in cretinism. Success is sure to come.

Goiter among newly born children who do not develop cretinism seems quite rare in this community. Drs. Frank Churchill and Samuel Walker of the Children's Memorial Hospital have seen none and do not recall

[1] Read before the Chicago Surgical Society, November 6, 1914. (See discussion p. 103.)

seeing any simple goiters in children under one year of age. Dr. Clifford Grulee of the Presbyterian and Cook County hospitals has seen none in the new-born and recalls seeing but one infant less than a year old having goiter, and this was associated with an enlarged thymus. In looking over the bibliography I found one reference to goiter in a six month fœtus and many, but scattered, references to goiter occurring in infants under one year of age. Dr. F. B. Riley states that he has posted no infants at the Children's Memorial Hospital having goiters and finds no reference to the subject in the pathologic records of recent years. Dr. Rudolph Holmes in his obstetric practice has seen no congenital or early infantile goiters. Dr. Joseph B. De Lee has observed several present at birth. One infant born of a goiterous mother had such a large thyroid gland that the child's chin was lifted and the head thrown back by it. In October, 1914, I saw with Dr. Overton Brooks a goiter in a babe six days old. The goiter appeared on the second day. The skin was dry, scurfy, and wrinkled, the hair gritty and thin; the enlargement was due to local tumefaction, which was firm, movable, distinctly circumscribed, the size of a pigeon's egg, and located in the lower pole of the right lobe. Its size was already diminishing and at the end of two weeks Dr. Brooks reported that it had entirely disappeared. He states that he had seen several goiters which appeared about the second day after birth and that they invariably disappeared early. He also states that they are found in babes born of poorly nourished mothers, who live in insanitary environments. The location and character of the mass, the changes in the hair and skin as seen in above case, are quite comparable to the findings in many children and some adults. Brooks' observations concerning their rapid and early disappearance suggests a physiologic enlargement peculiar to the earliest days of infancy. I do not doubt that certain congenital goiters or those occurring in early infancy may continue for indefinite periods of time.

Goiters of children. It is well known that our city lies within a goiter district. I can safely count on seeing five to ten goiters at my clinic at the Children's Memorial Hospital each Tuesday, often constituting a third or more of the patients present; most of these are return patients. Dr. Baugher recently told me that while walking on the street he could frequently count in each block three persons with goiters. I have heard Dr. Carlson say that 90 per cent of the dogs coming into his laboratory have goiter.

After the period of infancy (one year of age), we see goiters with increasing frequency until, between the age of six years and adolescence, they become very numerous. In the study of the various clinical features of simple goiter in patients of all ages I have seen able to recognize a certain group of symptoms which accompany this affection, publishing my observations in the *Illinois Medical Journal* in July of this year. While studying this subject I was struck with the uniformity of local as well as constitutional findings in children. These local findings have some clinical significance, and I venture to present them in detail for your consideration. They differ widely from the usual local and constitutional symptoms which characterize goiter developing during adolescence; on the other hand, the local findings are similar to those seen in some adults, and the constitutional symptoms are very similar to those seen in most cases of adult simple goiter.

These children show almost uniformly small goiters involving a well-defined area in the gland. About one in ten shows the lesion in the lower pole of the left lobe while nine of the ten appear in the lower pole of the right lobe. In both instances the antero-inferior lobule of the pole is the area involved and the isthmus is often invaded. These areas vary in size but are usually about as large as a pigeon's egg when first seen. As the mass enlarges it encrouches into the median line so that it may be difficult to distinguish just where the tumor originated. Some tumors lie partly in the isthmus and close to the lobe of the opposite side, or actually lie well upon the opposite side. When seen early the tumor is harder than the surrounding glandular tissue and the anterior surface is still flattened and the anterior border of the lobe still sharp, but the outlines of the hardened

mass are not well defined. In cases apparently more advanced, the induration is more distinct and the anterior border more rounded. These appear to be areas where encapsulation has started. In cases which I believe are still further advanced, the tumor is rotund, the outlines definite, the consistency very firm or fluctuating, the neck more distinctly enlarged, and encapsulation quite complete. Either of these processes usually involves a single lobule. When the primary nodule is large, or if other nodules appear in the same lobe, there is often the appearance of diffused enlargement in the same or both lobes. This is produced by lifting the superincumbent thyroid tissue of the lobe or by impinging upon the inner border or beneath the inferior border of the opposite lobe, thus bringing that lobe into prominence. Rarely have I seen goiter in children where I have convinced myself of general enlargement of one or both lobes. An experienced finger can usually separate an indurated or encapsulated mass from the remainder of that lobe, and thus demonstrate it to be the cause of the apparent diffused enlargement. The consistency of the uninvaded portion of the lobe is likely to be quite normal.

I have stated that these indurated masses are usually single and located in the lower pole. However, I occasionally see multiple nodules, none of which have the same form, size, or consistency as the original nodule. These nodules are smaller and appear most often when the primary node is hard, has never become well defined, and there is marked constitutional damage. They usually occur in the zone immediately surrounding the primary node and may diffuse throughout the gland, as a rule following the zonal plan of extension; they never blend with the primary growth or with one another while of moderate size.

The regions which were once indurated apparently may become distinctly encapsulated and grow to considerable size, but this occurs only in a small percentage of cases during child life. When these encapsulated masses are removed they are found to be benign adenomas. I have recognized varying degrees of toxicity accompanying these; many are very toxic. When these undergo central degeneration they give every appearance of a cystic growth. True cysts of the thyroid are relatively rare. That the toxicity is largely due to the encapsulated tumors is shown by improvements following their removal. Unilateral thyroidectomy is not often indicated for thyroid adenoma of childhood; single or multiple enucleation can usually be done.

There are certain nodular masses which appear in the median line immediately above the isthmus, or most often below it. They vary in size, consistency, and mobility, and have small pedicles, or none. In some cases these are supernumerary thyroid lobes and contain no diseased tissue, but many are lobular enlargements, such as I have described, which budded outward to the midline and became pedunculated or became free masses through attenuation and snapping of their pedicles. These are mistaken clinically for pretracheal cysts, and if they contain colloid or fluid from central liquefaction their tracheal origin is also suggested when after removal they are sectioned and examined macroscopically. Supernumerary lobes must not be removed except in case of some unusual and clear indication. When done, one must be very sure there will be sufficient healthy thyroid gland remaining.

True diffused enlargement of one or both lobes of the thyroid which shows bogginess and no nodulation, such as are seen among adolescents, are relatively rare among the children studied by me; I recall one.

Inflammation of the thyroid is not rare among children and usually causes only temporary swelling. There is no doubt that non-suppurative inflammations of the thyroid gland are causing serious troubles and are escaping recognition.

I have observed no other than these types of goiter in children in or about Chicago, though for the sake of rounding out my paper I might add that this organ is the seat of neoplasms in childhood as well as in later life, and that hyperthyroidism of children associated with goiter is no rare occurrence.

The chief type of goiter of childhood that I have dwelt upon is frequently associated

with diseased tonsils, which often contain great cheesy concretions or pus. All five cases examined in one afternoon contained pus in both tonsils. A sixth case had recently had a tonsillectomy. Subsequent observations have been in accord with these findings. Many of these tonsils look innocent until everted and their bases pressed upon, when retained materials exude.

In the past these patients have been quite generally looked upon as well, a simple goiter being a mere incident in their lives, and little or no attempt has been made to compile a constitutional syndrome which usually characterizes this disease; so that when one first studies these cases he may find one or more symptoms not pronounced or altogether absent, and doubt arises. Careful study of a few cases with a clear understanding of the subject will remove all doubt. No single symptom stands out prominently as do the individual symptoms of hyperthyroidism; but the symptom-complex is there, standing out just as clearly as the symptom-complex of hyperthyroidism.

The prominence of the symptoms will be largely proportionate to the apparent changes in the gland. The patients are usually below the standard of health and development; the stature is frail; a few seem to have grown well but are usually thin. The muscles are soft and the posture drooping; they fatigue easily, are lanquid, do not enjoy play, and are irritable. The face shows an old and careworn expression and many are not up to the proper school standard. They are often slovenly and are usually either slow and deliberate or abnormally alert. The voice is often weak. The hair, whether silky or coarse, clean or dirty, oily or dry, will usually show a gritty feeling; this is often general but sometimes occurs in small scattered patches.

One usually feels this at the first touch and quickly loses it, perhaps on account of the oil or moisture of his own fingers. The eyes are usually bright and watery, often associated with the pearly sclera seen in some malnourished or anæmic children. This bright eye with other accompanying findings frequently prompts the diagnosis of hyperthyroidism. The eyes answer none of the tests for exophthalmia. There is often a faint or distinct flush of the cheeks, sometimes extending into the lower eyelids, where there is excessive oiliness or moisture. This flush is a local skin hyperæmia due to vasomotor disturbance. It is out of proportion to the present state of the patient's health and the findings. The skin is rarely clear or shows a healthy glow, but usually the complexion is muddy, sometimes sallow, and the skin dry, greasy, or pimpled. Without cardiac or renal lesions they often show congested and mottled hands and feet which are moist and cold. The pulse rate is high. I have often seen it as high as 140, but it is usually between 80 and 120. The heart is often more tumultuous than normal, or easily made so, but never exhibits tachycardia such as is seen in hyperthyroidism. Careful inspection of the extended fingers will show fine fibrillary twitching of a fine choreic type or a coarse tremor, or both, limited to the hands and never tending to become generalized as does the fine tremor of hyperthyroidism.

There are no characteristic blood changes. The disease is not due to chlorosis, as has been frequently suggested. Any anæmia present is likely to be independent or a part of the constitutional damage.

The urine sometimes shows albumin, hyaline, and granular casts, but when unaccounted for through the history and by organic findings, and when these promptly disappear upon thyroid feeding, one must look at them as being the result of vasomotor disturbance—a part of the symptom-complex.

The treatment of goiter of childhood is reasonably satisfactory; all possible causes should be reviewed. The drinking water should be boiled or distilled and in obstinate cases brought from a distance, or when possible the child sent into a less goitrous district. The bowels should be regulated, exercise and outdoor life encouraged, and all focal infections cared for. Iodine in any form benefits a large percentage, but my results have been far better from the use of thyro-iodine as found in desiccated thyroid extract; I have used only the Armour preparation. The child must be fed just enough to produce the slightest signs of hyperthyroidism. Some patients do

well at once without the need of pushing the drug to a toxic point. The feeding must be kept up daily for months or years, according to the result obtained. Good health and proper growth must be attained and the goiter cured before the treatment is discontinued. Frequent interruptions in the treatment are thought to invite glandular hyperplasia because of suddenly throwing the gland into a state of self-support. Certain experiences of my own and Morgan's case cited in a previous paper, suggested this idea.

The less the encapsulation the more satisfaction results from thyroid feeding. Among those in whom there is only an indurated mass, some show disappearance of their goiters in six weeks; more of them in six months to a year; the same occurs in those which are slightly encapsulated, but in these a little nodule is likely to remain. Those showing distinct capsules shrink some in size. They may disappear when focal infections are removed and after many months or years of thyroid feeding. My experience is not encouraging. I usually enucleate these.

Many of these children while on thyroid feeding lose a little weight; others remain stationary, while others gain in weight. Most of the children show prompt nutritional improvement; many take on growth with surprising promptness and rapidity; one child was not recognized upon her return at the end of a few weeks; another lost her careworn expression, and her body, which was emaciated, filled out; she became bright and active. Another with a small isolated hypertrophic mass in the median line took six months to show marked constitutional improvement; at the age of seven he was like a frail child of four. His voice became strong; he lost his drooping posture, became filled with joy instead of being peevish, and grew in that time about three inches, gaining only four pounds in weight. Another boy, of fifteen years, who had a large mass in one lobe and who had marked stridor, sunken cheeks, frail stature, and easy fatigue; whose right heart was dilated, urine loaded with albumin, hyaline, and granular casts, systolic murmur at apex, showed in about nine weeks great diminution in the size of his goiter, and in ten months became of athletic build, having gained five and one-half inches in height and nineteen pounds in weight. He lost his stridor in less than forty-eight hours after feeding of thyroid was begun, and his urine was free from albumin and casts in two weeks.

When the encapsulated or slightly encapsulated masses begin to disappear, I have observed that sooner or later I fail to recognize the former definition of outline and that the surrounding area becomes indurated, shading off toward the normal gland. All of this induration finally disappears. I cannot account for this except by a round-cell infiltration, which may be a factor in resorption of materials in and about the mass.

The writer is well aware of the dangers of theories in these days of experimental physiology and surgery; but when confronted by so many experimental difficulties with this organ we must lay our foundation for the future building of knowledge concerning it, through deductions reached by analogy, clinical observations, and from experimental therapy. I therefore offer the following conclusions from the observations recited.

1. That simple goiter is of frequent occurrence among children in Chicago and is associated with a definite symptom-complex.

2. That this symptom-complex indicates a low grade of health varying in each child.

3. That goiter usually occurs in certain geographic districts and appears most frequently when certain waters are used for drinking purposes. These waters are often known to contain sewage. Our own water supply receives sewage from hundreds of farms, factories, villages, and cities. Because of this geographic distribution of the disease, corresponding to water routes receiving sewage and certain experiments showing that goiters do develop promptly when given these waters exclusively, drinking water is probably the chief cause of goiter. The water content causing goiter is probably bacteria or their chemical products.

4. That focal infections, particularly those of the tonsils, adenoids, and teeth of children, may supply the excess of bacteria ingested and produce goiter singly or in conjunction with the water supply.

5. That if these theories are correct the thyroid gland, which enlarges under these conditions, is an agent in the destruction of bacteria, as the blood passes through it in such great abundance, or that it provides a product to destroy these or their toxins in the blood. I am told that positive growths are now being obtained from goiters and from the blood of such patients. That when the work of the gland is excessive it enlarges through hypertrophy; when compensation is incomplete or the dose continuously large or toxic, constitutional damage follows.

6. That because of the location usually singled out in which hypertrophy begins, differentiation in function of the various areas of the thyroid gland is suggested.

7. That because invasions of the thyroid gland beyond the primarily enlarged nodule usually occur in the lobules immediately surrounding it and this zonal plan of extension often continues but only in toxic cases overlapping function of the lobules is suggested.

8. That the primary nodulation is a hypertrophy of compensatory character; if the cause is not removed the original lobe to take on enlargement continues to increase in size and results in cell damage; that the process may extend to other lobules; that the involved cells either become useless or the secretion of the lobule becomes toxic and there is spontaneous encapsulation; that probably the capsule is firm and thick in proportion to the damage to its contents or the toxicity of its secretion.

9. That these lobules in the lower pole of the right lobe, rarely in the left, are the common seat of benign adenomata of adults.

10. That because we do not often see this type of goiter in adolescents there is usually a spontaneous recovery during childhood.

11. That many of this type of goiters improve locally and some disappear on the giving of thyroid or the removal of focal infections, or both, while in all there are marked constitutional improvements.

By the term *adolescent goiter* I wish to imply only goiter developing during adolescence. As I have observed them, they usually appear as bilateral affections, but not infrequently unilateral. When unilateral, the swelling in the majoirty of cases occurs in the right lobe. Then enlargement is diffused through one or both lobes, which are boggy; and rarely are there any nodular masses felt in the gland, such as are seen in goiter of childhood. From my experience I am of the opinion that these do not often undergo degenerative changes from long-standing hypertrophy, and therefore rarely show resulting benign adenomata. I am also impressed with the belief that glandular hyperplasia does occur in a great number of these and that a larger number than we have heretofore recognized suffer from a mild degree of hyperthyroidism, while no small proportion develop early and distinct signs of it.

There is no doubt that the majority of uncomplicated cases of adolescent simple goiter undergo spontaneous cure and that the same occurs with most of the mild cases of glandular hyperplasia of adolescence in whom the symptoms of hyperthyroidism have not been distinct. The latter are extremely slow to recover, resist treatment much more than simple adolescent goiter, and are made worse by thyroid feeding. Those which seem to resist treatment show especially vasomotor disturbances extending well into the lids, which are often puffy. They often show a bad complexion, poor muscle tone, and also easy fatigue. Their pulse rate is high, the blood-pressure a few points low, and a fine regular fibrillary tremor is shown in the extended fingers. The heart becomes rapid and disturbs the patient upon slight exertion, but there is no tachycardia. These symptoms are the frequent forerunners of hyperthyroidism in late adolescence or early adult life.

Usually the patient developing goiter of adolescence who is destined to spontaneous recovery shows also a watery eye and flushed cheeks. The skin is usually clear, probably because of the shortness of duration and the undeveloped toxicity in contradistinction to what we usually see in goiters of childhood.

Throughout this affection we have not had uniformly prompt results from treatment during adolescence, yet sometimes the results are prompt. In cases showing little toxicity, and therefore but slight constitutional

damage at or after the adult period has been reached, the results have been much more prompt. We do not know the cause of the usual type of goiter occurring during adolescence and must still content ourselves with that most vague explanation that it also is a diffused cell hypertrophy, caused by complex changes in the glands of internal secretion, which takes place at this period of life. What will benefit one of these will not always benefit another. Experience, however, shows that it is worth while to look to the water supply, give iodine or thyro-iodine when there is no suggestion of hyperthyroidism and attend to focal infections. I always encourage early afternoon rests in bed, graded athletics, and an open air life.

In discussing the subject of goiter writers give much space to the subject of goiter of infancy, which is relatively rare, and dwell at length upon goiter of adolescence. Neither of these subjects appears to me to be nearly so important as goiter of childhood because of its frequency, the accompanying constitutional damage, and the permanency of that damage. Each recognition, diligent supervision, and treatment will spare most of these patients future deformities resulting from goiter and restore them to a good state of health.

A REPORT OF THREE CASES OF FIBROSCLEROSIS OF THE PENIS TREATED BY RÖNTGENIZATION, WITHOUT IMPROVEMENT

By CHARLES A. WATERS, M.D., and J. A. C. COLSTON, M.D., Baltimore, Maryland
From the Departments of Actinography and Genito-Urinary Diseases of the Johns Hopkins Hospital

THE following is a brief report of three cases of the rather rare condition known as plastic induration, or fibrosclerosis of the penis, which were observed in the genito-urinary clinic of the Johns Hopkins Hospital, and in which thorough röntgen irradiation was carried out without any appreciable improvement. Two other cases were observed, but the amount of irradiation was insufficient to warrant drawing any conclusions in regard to the value of this treatment. This condition apparently does not respond to any known treatment, and the favorable report of Bernasconi (1) by his method of treatment, led to a thorough trial in the cases reported. Occasionally, in selected cases, operative procedure has been followed by successful results, but in the vast majority of cases surgical interference offers very little.

The three cases reported in this paper are typical examples of the condition known variously as Peyroni's disease (from Peyroni, who first described the condition), induration plastique des corps caverneux, ganglion penis, nœuds des corps caverneux, plaque indurée, cavernitis senilis, induratic penis plastica, and fibrosclerosis of the penis. The latter term would seem to be better adapted, in that it is based more correctly on the pathology of the disease, but German writers have given the preference to induratio penis plastica.

The onset is insidious, usually occurring between the ages of 40 and 60, and the indurated areas are not noticed until brought suddenly to the attention of the patient by the deflected erections. These areas are firm, cartilaginous in consistency, and not tender; they are situated on the dorsum of the penis, and are attached to one or both corpora cavernosa. Their margins are indistinctly felt, and the induration gradually blends off into the normal surrounding tissue. Erections may be quite painful, and, sooner or later in the course of the disease, intercourse is entirely prevented, both for this reason and on account of the bending of the penis on erection due to the poor blood-supply of the indurated part. On this account melancholia and neurasthenia are often associated with the disease.

The nodes usually remain unchanged or slowly progressing, but cases of spontaneous regression occur, the cause of which is difficult to understand; and it is cases of this type which have been reported as cures under various kinds of treatment which have absolutely no effect on the progressive cases (zur Verth and Scheele [2]). Exhaustive studies on the pathology of the condition, principally by Galewsky and Hübener (3), Tuffier and Claude (4), Chetwood (5), Sachs (6), Frangenheim (7), Stopczanski (8), and zur Verth and Scheele (2), show that the process arises first in the loose areolar tissue lying external to the tunica albuginea and in the tunica albuginea itself, the septum and corpora cavernosa becoming invaded by the extension of the process. In the later stages there may be development of cartilage, and even true bone, and this side of the subject has been extensively studied by Frangenheim.

The frequent occurrence of the diseases of metabolism, chronic rheumatism (as in our three cases), gout, diabetes, etc., certainly suggests that there is a definite relationship of the disease with disturbances of metabolism. It has also been noticed in cases of Dupuytren's contracture (Neumark [9]). According to Sachs (6), these nodes arise in the tunica albuginea, being formed solely from the fibroblasts which surround the smaller vessels, and are entirely without the association of inflammatory elements. The first stage occurs as a cellular proliferation in the tunica albuginea, gradually replacing the elastic fibrils which are normally present there, and the process may continue to the development of osteoblasts from the connective-tissue fibrils; thence to true bone formation.

Tuffier (10) considers that the condition is an age phenomenon of the elastic tissue, and concludes, after an examination of 2,500 cadavers, that a physiologic thickening of the septum and tunica albuginea occurs in old men with a disappearance of elastic fibers. These changes are accentuated in arthritism, which affects mainly the fibrous system,— tophi, arthritis deformans, Dupuytren's contracture, etc.,— and the indurated areas can be compared to similar degenerations in the joints, capsules, and aponeuroses of old men. Aschoff (11) also states that elastic tissue loses its elasticity after the fourth decade, due to connective-tissue proliferation.

Fibrosclerosis may also occur as a result of hæmorrhages in the tissues and may be of specific origin. The cases reported cured by potassium iodide probably belong to this latter group.

The prognosis is very unfavorable, the lesions slowly progressing and resisting all therapeutic efforts. Mercury and iodides are effectual only in cases of specific etiology. Local applications, baths, massage, galvanic and faradic current, arsenic internally, and many other methods have been used with little or no result. Wälsch (12) has reported a case cured by subcutaneous injections of fibrolysin, but other authors have had no result with this drug.

Posner (13) first suggested treatment by röntgen ray, and Bernasconi (1) reported the first cure by this method. His patient, a man aged 34, with a rheumatic history, was cured with complete disappearance of all indurated areas after eighteen treatments. Zur Verth and Scheele (2) reported three cases treated by irradiation, two of them without benefit. In one case there was symptomatic improvement, and the indurated area was smaller but still present when the patient was seen after a year. Only ten treatments were given to this patient, and it seems doubtful if lasting improvement could occur when our cases failed to show any regression after the most intensive röntgenization.

A confusing factor which may lead to the premature report of a cure or improvement is the general infiltration of the surrounding tissues due to the irradiation which tends to obliterate the outlines of the sclerosis and which occurred in Case 1.

The operative treatment offers by far the most encouraging prospect. Galewsky and Hübener (3) report the first successful operation, and since then several cases have been cured in this way. A careful dissection of the plaques should be made with as little hæmorrhage as possible; and local anæsthesia should not be used, as the outlines of the affected

tissues are obscured. Recurrences frequently occur, as can be readily understood from the hæmorrhage and the difficulty in accurately outlining and removing the diseased tissue. However, zur Verth and Scheele have collected from the literature fourteen cases which have been operated upon, with eight cures, one improvement, two recurrences, and three lost sight of. It would seem, nevertheless, that the percentage of successful cases would be considerably lower than this. Operation has not been carried out in any of our cases, but Bloodgood (personal communication) has had one case which has been cured. In another case operated on by Young (personal communication) the distal end of the indurated area was dissected free, and sewed into the foreskin, with restoration of function, at the last time the patient reported, five years after operation.

CASE 1. J. C., age 59, unmarried. First seen July 23, 1913, complaining of inability to have sexual intercourse on account of the upward bendng of the penis. The patient gave a history of rheumatism for twenty-five years. The present condition was first noticed five years ago, and made rapid progress, but for the last four years has remained stationary.

On examination of the penis an indurated mass extended along the median line from the glans back between the corpora cavernosa for a distance of about 4 cm. In its thickest portion the mass is 1 cm. in diameter, tapering gradually until it is lost proximally in the last 3 cm. of the penis, and distally in the glans. Throughout its extent it is smooth and cartilaginous in consistence. The flaccid penis has a distinct upward curvature.

Röntgenogram of the penis was negative for shadows of ossification. Wassermann reaction was negative. Diagnosis of fibrosclerosis made and intensive röntgenization immediately started.

First treatment was given on July 23, over the anterior surface of the penis, the abdomen, testicles, and pubic region being protected with sheet lead. A treatment was given every day.

The technique for the first fifteen treatments was as follows: A 2 mm. filter was used to protect the skin from detrimental effects of the soft rays; focal distance 20 cm., pastille and filter distance 10 cm. The Sabouraud-Noire pastille and Holzknecht radiometric system was employed. The pastille was placed just under the aluminum filter and protected from heat, light, and dust with a piece of ordinary black wrapping paper. A hard tube with the penetration of 10 to 12 Benoist was used, that is, after the interposing of the aluminum filter, before which the tube would have had the penetration of 6 to 8 Benoist. We have employed tubes 6 to 8 Benoist as a standard in other cases. The penetration is increased a trifle more, however, when 3 mm. of aluminum are used, as we are now using in these cases. The duration of each irradiation was three minutes; the milli-amperage 8 to 10; dose 2 H. After the sixth irradiation, patient said erection was better. This we believe to be a pure psychic effect, as no change in the mass could be detected.

August 11th, patient awoke in the early morning with pain, swelling, and redness of the penis. Examination showed a mild erythema, and irradiations were discontinued. August 12th, he developed a balanitis and paraphimosis with a purulent discharge, but repeated microscopical examinations of the discharge failed to show gonococci. Progressive changes in the reaction to irradiation occurred until August 21st, when the symptoms began to subside.

Summary shows that he had received a dose of 30 H on the same area over a period of sixteen days; six times the erythema dose. He reported again on September 2d, after a rest of ten days. The penis was not inflamed, but the mass showed no appreciable change, the dimensions being 4 cm. long, ¾ cm. wide, ½ cm. thick.

September 2d, irradiation was again started with slight alteration in technique. A 3 mm. aluminum filter was substituted in place of the 2 mm. as formerly used, and irradiations given daily. On October 20th, patient reports that erection was more vigorous than at any other time during the past five years, but no change could be made out in the extent of the induration. November 4th, patient reports decrease in the area of induration. Examination shows an easily demonstrable diminution in the size of the area of induration, which now measures about 1.5 cm. in length with a corresponding decrease in diameter; this, however, we later determined was due to the infiltration in the tissues around the indurated area caused by the massive röntgenization. The appearance of the treated area is normal; there is no pigmentation, scaling, erythema, or signs of röntgenism. December 5th, patient returns after an omission of all treatment for one month. The mass appears definitely outlined, and apparently of the same dimensions as when first observed: 4 by ¾ by ½ cm.

In all, a total of sixty-two irradiations was given over a period of nearly four months. The irradiations after September 2d were given on the posterior surface, the penis being reflected back on the abdomen; making a total of forty-six such irradiations of nine erythema doses on the same surface over a period of not quite two months.

The infiltration of the surrounding tissues has now disappeared, so that the unchanged indurated mass could be made out as definitely present and not appreciably changed.

CASE 2. J. W. E., age 62, married. Came for consultation on October 16, 1913, complaining of deflected or crooked erections and hard lump in his

penis. Family history negative. He has never had gout, but states that during the past two years has had some indefinite rheumatic pains, and the distal points of his fingers have slowly but painlessly swelled. There have been no other joints involved.

This condition was first noticed in February, 1913, when he awoke at night with an erection, and noticed the penis bent in such a manner that the glans was directed obliquely toward the abdominal wall. There was only slight pain at this time, and he noticed a hard lump on the anterior surface of the penis near the glans. The penis has been similarly bent at each erection since this time, and somewhat painful, but intercourse is still possible. The patient thinks the lump is spreading in both directions, and the bend is becoming more and more pronounced. Examination of the penis reveals an extensive, long, indurated mass, apparently attached to the corpora cavernosa, measuring about 5 cm. in length, and 2 cm. across in its thickest portion. It is hard, cartilaginous, and nodular, and extends back between the corpora cavernosa to the triangular ligament. The skin over the mass is freely movable, and the corpus spongiosum is normal. There is slight prostatic enlargement. Wassermann test negative, and röntgenogram of the penis is negative for shadows of ossification.

A diagnosis of fibrosclerosis was made, and treatment started at once. Irradiation was started on October 17, 1913, and a 3 mm. aluminum filter used also in this case. A 3½ H dose was given daily, until November 14th, to the anterior surface of the penis. At this time there appeared a slight reddening with some infiltration of the tissues, but not to such a great extent as in Case 1, and there was no apparent change in the size of the induration. The patient also noticed no change in his symptoms, the erections still remaining markedly bowed.

December 5th, the patient returns and the mass shows no change; there is no infiltration of the tissues or cutaneous reaction. The irradiations were resumed daily, using the same technique over the anterior surface until December 11th, when the patient went home. On December 24th he wrote that there was some inflammation of the skin with the formation of vesicles, but no appreciable change in the lump, and erections still bowed. On January 22, 1914, the patient reported for observation, and the mass could be felt practically unchanged, and there was no evidence of reaction. Daily irradiations of 3½ H were given, but to the posterior surface of the penis, until Febuary 9th. On this date a beginning reaction to treatment was noted, and irradiations discontinued. Careful examination showed a beginning infiltration of the tissues, but no definite change could be detected in the size and consistency of the mass. On May 15th the patient wrote that the erections were still bowed, and the mass apparently unchanged.

Case 3. J. B. K., age 47, married, was first seen on September 18, 1913, complaining of bending of the penis on erection. Family history negative. He has suffered from boyhood with rheumatic pains in the back and shoulders, and states that his feet and ankles have, at times, been swollen and red. Had gonorrhœa at the age of 27, discharge lasting three or four months, then completely disappearing. Patient had another attack of gonorrhœa a year later which lasted only three or four weeks, and a year later a sore on the penis, which was diagnosed a hard chancre, and received antisyphilitic treatment at intervals for a period of two years. There was no sore throat, skin eruption, alopecia, or other evidence of secondary symptoms.

The patient first noticed that the penis was bowed, on erection, six weeks ago. At the same time he noticed a small lump on the right side of the penis, and a larger one on the left side. These are hard, but not tender, and he has no pain when the penis is erect. He has not attempted intercourse since this trouble.

On palpation there is a distinct induration in the septum and left corpora cavernosum, beginning about 5 cm. proximal to the coronal sulcus, and extending back for about 3 cm. This indurated area is about 2 cm. in diameter in its broadest portion. There is a similar area felt in the right corpus cavernosum about 3 by 1 cm. in dimensions. Both are freely movable, and the corpora spongiosum is normal. Prostate normal. Wassermann reaction negative, and röntgenogram shows no evidence of areas of ossification.

A diagnosis of fibrosclerosis was made and treatment immediately started. Irradiations were started on November 4, 1913, using the same technique as in Case 2. Daily treatments were given to the anterior surface until November 13th, when the exposures were directed to the posterior surface until November 15th, giving eight irradiations to the anterior surface, and three to the posterior. There was a slight infiltration of the tissue and apparently some diminution in the size of the indurated areas. The patient returned home and reported by letter a week later that there was reddening and swelling of the penis.

On January 15, 1914, he again reported by letter that the reaction, which he had noticed on returning home, had rapidly disappeared without any untoward symptoms, and the infiltration had gradually disappeared. The lumps, however, have remained unchanged, and the patient thinks that there is no diminution in their size and induration. The erections are still bowed. Although this patient has not been seen since the irradiations were discontinued, there seems to be little doubt that the indurated areas have not been affected, although the dosage was sufficient to cause a definite reaction.

CONCLUSIONS

1. Röntgenization, even when very intensive, has apparently no temporary, and certainly no permanent, effect on fibrosclerosis of the penis.

2. The infiltration of the surrounding tissues under intensive irradiation tends to lead to erroneous observations unless careful and repeated examinations are made.

3. Operative treatment, consisting of simple excision with as little hæmorrhage as possible but with as complete excision of the lesion as can be accomplished, seems to offer the best prospect for a permanent cure.

We are indebted to H. H. Young, J. T. Geraghty, and F. H. Baetjer for many helpful suggestions during the course of this work.

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INTRA-ABDOMINAL DYNAMICS AND MECHANICAL PRINCIPLES INVOLVED IN THE CAUSE OF BACKWARD AND DOWNWARD DISPLACEMENTS OF THE UTERUS[1]

By GEORGE H. NOBLE, M.D., Atlanta, Georgia

In the study of this subject one should not be content with mere theory, but should have some practical knowledge regarding pressure within the abdomen under varying conditions, in the active or passive state and in normal or abnormal health. To determine these points, the writer made some experiments that seem to have been successful in arriving at a working basis.

An apparatus was made consisting of two rubber bags, one placed within the other, and to prevent over-distention and rupture a silk sack was placed between them. The triple bag thus arranged was connected by tubing to a Faught's blood-pressure apparatus for the purpose of correct reading (Fig. 1). When testing intra-abdominal pressure the collapsed bag was placed within the inverted sack of suitable post-operative or other hernias which were free from obstructive adhesions, and a quantity of air sufficient to inflate the bag without undue pressure was pumped into it. The pressure was not enough to elevate the recording mercury column more than a few mm. above the level of its fellow. The zero mark of the graded scale was placed opposite the mercury level and changes in the reading carefully recorded as tests were made. Of the many points of interest which developed a few relating to this subject are briefly recounted here.

In the normal subject abdominal pressure is *nil* when the patient is lying upon the back, but on assuming the sitting or standing position it increases to 18 mm. Tension of the abdominal wall in maintaining the upright position is sufficient to account for the change, the weight of the intestines not being great enough to produce the effect. The squatting position causes compression of the viscera, which increases the pressure to 20 mm. Inspiration in the recumbent position

[1] Read before the American Gynecological Society, Boston, May, 1914.

shows 5 mm. In the passive state the abdominal walls are more or less relaxed and yield to diaphragmatic displacement; the reading, therefore, indicates normal muscular tonicity. When sitting or standing the muscles are tense, resist the force of the diaphragm to a great degree, and cause in these two positions 18 to 30 mm. of pressure respectively. On the other hand, expiration in all postures mentioned failed to show any pressure whatever. In coughing or straining at stool the muscles are more rigid and diaphragmatic contraction is greater; here registration shows 30 to 40 mm.

If the testing bag is placed in the vagina beneath the cervix it will indicate 20 mm., less pressure than the abdomen indicates before the pelvic floor begins to bulge; but when full distention occurs the reading on the scale reaches the maximum (average 80 mm.).[1] The interpretation of this is that the uterine ligaments sustain 25 per cent of intra-abdominal strain; beyond that they stretch sufficiently to transmit it to the levator muscle and its contiguous fascia.

In lacerations of the perineum with cystocele and rectocele little or no force is registered unless firm counter-pressure is made with perineal pad or until the patient sits upon some hard substance. In such circumstances the full force from the abdomen is measured in the vagina at the site of the lacerated perineum. If the abdominal walls are much relaxed the pressure is less, for diaphragmatic displacement is dissipated before the abdominal muscles are put upon strain sufficient to create resistance. With the abdomen firmly bandaged and perineal counter-pressure employed the test will show vaginal pressure equal to abdominal.

ANATOMY

Wherever there is force there is resistance, and this brings us first to a brief review of the arrangements and anatomy of the supports of the organs contained within the pelvis. For instance, the lumbar, transversalis, and iliac fasciæ line the abdomen external to the peritoneum and, extending downward, become continuous with the pelvic fascia, which lines the pelvic cavity. The fascia is attached to the bony framework of the pelvis; in front, to the body of the pubic bone as far forward as the lower border of the symphysis; on the sides, to the ileopectineal line; posteriorly, just above the attachment of the pyriformis; and is finally lost on the anterior surface of the sacrum. In its descent the fascia divides into several layers, the principal ones being the obturator and rectovesical. The latter passes downward over the inner surface of the levator ani muscles to join the fascia of the opposite side, thus effectually closing the lower end of the immense fibrous bag.

One layer of the rectovesical fascia is reflected over the bladder and becomes its fibrous coat. Another layer is reflected on to the uterus and curves backward external to the pouch of Douglass and is firmly attached to the ischial spine on either side. In its descent in the pelvis the pelvic fascia forms a true and a false bottom to the fibrous bag above referred to. The true bottom contains the several sheets in the pelvic floor — the deep pelvic, the triangular ligaments, and the rectovesical fascia in its relation to the levator ani muscle, etc. The false bottom is formed by the reflected sheets of the rectovesical and deep pelvic, which support the bladder, uterus, and rectum, and contribute to the component parts of certain ligaments of the pelvic organs.

The structures entering into the formation of the pelvic floor are designated as the buoyant supports, while the false bottom in connection with the ligaments is the suspensory support of the pelvic organs. Nature has in this way made double protection against the stress of intra-abdominal strain, and provided for its gradual dispersion to the side walls and floor of the pelvis, thus eliminating the shock of sudden contact with the unyielding surface and the liability to laceration of ligaments, peritoneum, etc., that might occur under the influence of violence. With these this paper will deal briefly, attention being confined principally to the ligaments of the uterus.

Deaver describes them as being of two kinds; false and true. The first are peritoneal folds, so well known that they need not be mentioned here. The latter, the round, uteropelvic, and the uterosacral ligaments

[1] Hard coughing.

are made up of fibrous and muscular tissue, and on that account concern us most. They are unstripped, muscular prolongations from the uterus, and, therefore, are affected and behave in a manner not unlike the uterine muscularis. They become softened and relaxed in similar circumstances and suffer the effects of puerperal infection when it extends to the peritoneum or parametrium. They may even become thickened or hypertrophied in pregnancy and in chronic inflammatory (vascular) conditions of the cervix, such as carcinoma, and be mistaken for an extension of the disease. In health the muscle lends elasticity to the ligaments — not the contractility that is characteristic of voluntary muscle, but resiliency. It contributes to motion and rebounds and assists in controlling physiological mobility of the uterus. But one of its main uses is its capability of hypertrophy and participation in bearing the increasing weight in the early months of pregnancy.

These ligaments in pairs possess individual functions. The round ligaments running from the cornua upward, outward, and forward to the inguinal canal are so placed that they cannot effect a sustaining influence upon the uterus in the normal position, nor are they put upon severe strain until the cervix protrudes from the vagina; for the uterus in backward and downward displacement describes an arc, the radius of which is represented by this pair of ligaments — and the radius of an arc is constant (Fig. 1+). The function of the round ligaments is to hold the fundus forward and to maintain its even balance in the pelvis. But when imperfectly developed, relaxed, or elongated they fail in this specific function; then, from the effect of posture or excessive distention of the bladder, etc., retroflexion occurs.

The superior uteropelvic ligaments, extending from a point below the attachment of the fallopian tubes to the uterus, outward to the lateral walls of the pelvis, possess a limited range of utility. They are extremely small, and from their points of attachment and from the naturally relaxed state of the upper border of the broad ligaments, cannot directly hold up the pelvic organs. Like the round ligaments they act as guys to the top of the womb.

The inferior uteropelvic ligaments, being attached to the side of the cervicocorporeal junction and walls of the pelvis above the obturator muscle and lying in the plane of the broad ligaments, exert an upward and lateral traction and have a tendency to prevent downward and backward motion of the uterus in the direction of its long axis (Fig. 2 and Fig. 2+). They do not act as aids to the uterosacrals in holding the cervix in the posterior section of the pelvis except as counter tractors. A line passing along one of the inferior uteropelvic muscles, through the cervix and up the other, would form an angle at the point where it traverses the neck of the uterus. The cervix, therefore, may be said to be sitting in a swing formed by these two bands of muscular tissue, and, so far as the control of these bands is concerned, it might swing back and forth with little restraint. They do not hold the neck of the uterus in the hollow of the sacrum, as claimed by some authors, as is proved by the relations here described. If the lateral traction is sufficient to exert such an influence it is so limited that very slight relaxation of the muscles will permit the lower segment of the uterus to advance to the vaginal orifice[1] (Fig. 2+).

Anatomists with few exceptions describe the uterosacral ligaments in common, and agree that they are flat, muscular bands extending from the junction of the body and cervix of the uterus to the articulation of the second and third sacral bones or to the sacrum opposite the lower border of the sacro-iliac joint. "The muscular fibers which run in the uterosacral ligaments are more or less continuous, not only with the fibers of the uterus, but with the muscular fibers about the region where the ureters enter. There are also muscular bundles running from the sides of the bladder — below where the ureter enters — to the vagina, and again from the vagina to the walls of the rectum."[2]

Motion imparted to the uterus by superimposed force puts the utero-sacral ligaments upon a strain in the direction of their longest dimensions. The neck of the uterus cannot

[1] The diagram drawn to scale illustrates this feature conclusively.
[2] McKay, p. 223.

move forward without relaxation, or unless the pressure is sufficient to stretch these ligaments. They, therefore, limit the motion of the lower pole of the uterus and maintain it in a more or less fixed position in the posterior part of the pelvis. They preserve the balance and equalize the strain in front and behind the uterus, maintain the normal size of Douglass' pouch, and help to turn the body and fundus of the uterus forward in such a way that intra-abdominal pressure is exerted upon its posterior surface with a tendency to antevert the organ.

The principal parts of the buoyant supports or the pelvic floor are the levator ani muscle (including the coccygeus), the rectovesical and deep pelvic fasciæ, the triangular ligaments, and the coccyx.

The periphery of the levator muscle, being attached to the sides of the pelvis and its central portion to the coccyx, is deeply concaved, and resembles a bowl with its rim tilted forward and upward, the plane of which cuts the horizon at an angle of about forty-five degrees. The central point of its concaved bottom is behind the anus; and the bowl-like muscle, therefore, is represented as lying upon its side, through which the rectum and vagina pass. These two canals incline upward and backward at sharp angles to the side of the muscular bowl, and lie directly upon its inner surface. The uterus and the bladder rest upon both of them. The uterus, inclined as here described, lies nearly parallel to the puborectal portion of the muscle and quite parallel to the external margins of the vaginal orifice. Its anterior surface is then presented to the sides of this muscular bowl and the vaginal outlet.

Under excessive strain the uterus would be driven down upon the bladder and vagina, and, in turn, would force these organs upon the levator muscle and into the vaginal introitus, covering the latter with its broadest dimensions and not with its wedge-like extremity (the cervix), and would effectually block its own expulsion. The pelvic floor is so constructed that it becomes the greatest support of the pelvic viscera, taking 75 per cent of the strain.

PHYSICAL FEATURES

Having set up the principles of force and resistance, the physical features involved now require attention.

Pressure contained within a cavity exerts its influence in all directions equally, and can be no greater than the weakest point of the container, for it seeks the direction of least resistance. If a ball be placed in a closed cylinder surrounded with water or other fluid, and subjected to pressure, the force will be distributed equally over the surface of the ball. If, in place of water, the ball be surrounded by numerous rubber bags or tubes containing water and air, the effect will be the same. If, in place of the ball, the uterus be substituted, the pressure within the container would be expended upon it in identically the same way. Further, if the closed cylinder be substituted by the abdominal and pelvic cavities, and the intestines be represented as taking the place of the rubber tubes, it will be apparent that the effect of pressure within the abdominal cavity is not unlike that exerted upon the ball in the cylinder; that is, an equal distribution of pressure above, behind, and in front of the uterus — or upon all of its exposed parts. (Fig. 3.)[1]

If the pelvic supports were absolutely rigid, it would be contrary to any known law of physics for intra-abdominal pressure to disturb the position of the uterus. But, as such is not the case, and since it has been shown that abdominal dynamics do influence the pelvic organs, some change in the position or relation of the structures below and external to the pelvic peritoneum must take place before this force can alter the balance of the uterus. Then, as the tendency of abdominal pressure is to drive the pelvic organs and floor of the pelvis directly before it, the weaker parts become the most impressed while the more fixed tissues suffer the least displacement.

In changing conditions the surface of the uterus exposed to pressure varies, which circumstance necessitates a comparison of the dynamic influence on different parts of that organ. This we can do by relative expressions

[1] The illustration for Fig. 3 was made with an adjustable or movable picture that is too complicated to put in print.

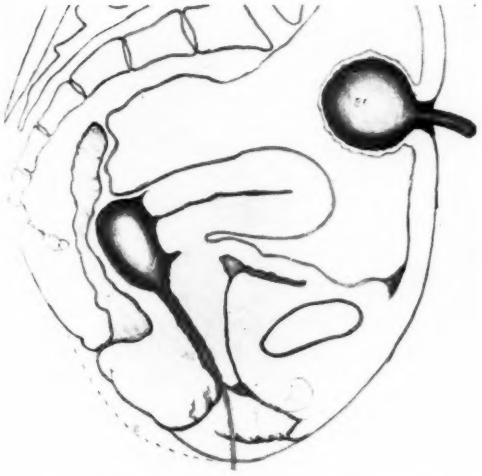


Fig. 1. When testing intra-abdominal pressure the collapsed bag was put within the inverted sack of suitable post-operative or other hernias which were free from obstructive adhesions.

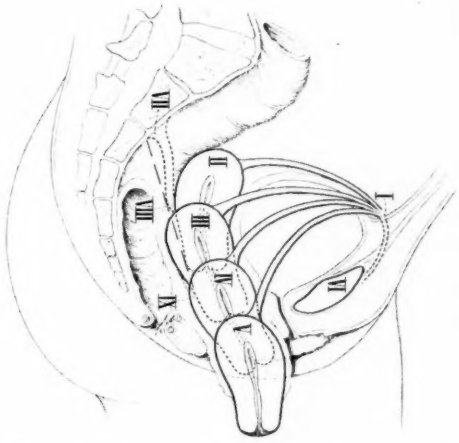


Fig. 1+. The uterus in backward and downward displacement describes an arc, the radius of which is represented by the round ligaments — and the radius of an arc is constant. Their function is to hold the fundus forward and to maintain its even balance in the pelvis.

only, on account of inability accurately to measure the surface of the pelvic peritoneum, and accordingly a system of units has been adopted to take the place of customary notations in pounds, ounces, etc.

In this matter effects must be reckoned with respect to the center around which the uterus rotates in backward and downward displacements. It is located near the internal os at the attachment of the uterosacral ligaments; its axis lies transversely in the base of the broad ligaments. I have called it the pivotal point. As the uterus is balanced on this point by reason of its posterior ligamentous attachments, comparison of pressure upon its lower and upper poles must be made with this center as a line of demarcation between the two extremities.

Parts of the uterus exposed to pressure coincide with its peritoneal coverings. Its area on the lower pole is represented by units 1, 2, and parts of 0 and 3, while 4, 5, 6, 7 (Fig. 4), stand for the upper pole, there being one unit excess on the latter. It is the longest, and its forward tilting has been described as a lever-like action. This action is much increased when the superior borders of the broad ligaments are sufficiently relaxed to let the corpus uteri lie upon the bladder, for the pressure area of these ligaments is greater behind than in front; stress, therefore, would force the body of the uterus and bladder against the levator muscle and over the vaginal orifice. But when the bladder is distended, or when the intestines lie between it and the uterus, abdominal pressure is transmitted through them to the anterior part of the uterus; then the four units, 10, 11, 12, and 13 (exerting a lifting effect) neutralize units 4, 5, 6, and 7 behind the corpus. The lever-like action is reversed, for pressure in the cul-de-sac — 1, 2, and parts of 0 and 3 — carries the lower pole forward, and the upper pole moves to the rear. This clearly indicates the use of the round ligaments, for without them to hold the fundus in position the difference of pressure favoring forward inclination of the uterus might be overcome easily.[1]

Inspection of Fig. 5 discloses the fact that, no longer occupying the anterior segment of

[1]It also explains the reason girls and young women with immature development or slight infantilism are so frequently subject to retrodisplacements. And I may add that the lack of development in the body of the uterus results in decrease of pressure area behind the corpus and coincidentally a relative increase of pressure bearing surface in the pouch of Douglass, or a reversal of normal status.

Fig. 2. The inferior uteropelvic ligaments, being attached to the side of the cervicocorporeal junction and walls of the pelvis above the obturator muscle and lying in the plane of the broad ligaments, exert an upward and lateral traction and have a tendency to prevent downward and backward motion of the uterus in the direction of its long axis. They do not act as aids to the uterosacrals in holding the cervix in the posterior section of this pelvis except as counter tractors. (See also Fig. 2+.)

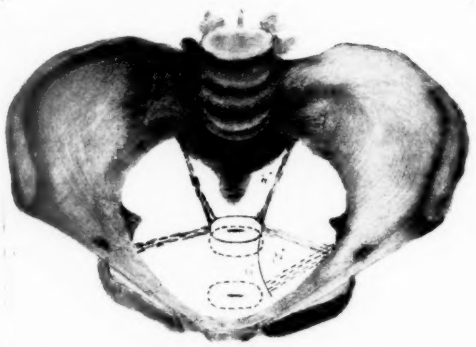


Fig. 2+. The uteropelvic ligaments do not hold the neck in the hollow of the sacrum as claimed by some authors, on account of the relations here described, or if the lateral traction is sufficient to exert such an influence it is so limited that very slight relaxation of them will permit the lower segment of the uterus to advance to the vaginal orifice.

the pelvis, the uterus is not subject to forcible displacement against the bladder and levator ani muscle, nor of imparting to the pelvic floor 75 per cent of incumbent stress, but that its own weight rests upon the broad uteropelvic and uterosacral ligaments. Added to this is the strain of abdominal pressure as indicated by all the units in contact with the peritoneum of the bladder, uterus, and Douglass' pouch (1, 2, 3, 4, 5, 6, and 7). The cumulative effect of these is an over burden far in excess of the normal 25 per cent. The testing bag shows in place of 20 mm. of pressure being sustained by the ligaments that almost the full amount of intra-abdominal pressure is registered in the upper extremity of the vagina. The base of the broad ligaments being no longer restrained by the presence of the corpus uteri between it and the pubic bone swings forward and diverts the greatest strain to the uterosacral ligaments. With forward movement of these ligaments there is an increase in the area of the pouch of Douglass, and a consequent increase of pressure. The larger the pouch grows the greater becomes the force behind the uterus; the increased number of pressure units behind the cervix drive it forward, the inferior uteropelvic ligaments pull the lower pole forward, the posterior ligaments give way, the pivotal point moves downward and advances to a position anterior to the center of gravity of the uterus. Pressure units in front and behind the body neutralize each other, and as the balance of the uterus is thus disturbed it next assumes the position of retroversion.

Figure 6 exhibits the retroverted uterus. In this position the units (1, 2, 3, 4, 5, 6, 7, 8, and 9) cover the entire pelvic peritoneum and indicate that the pelvic organs are subjected to the maximum strain originating in the abdomen. This strain is augmented in the erect position by gravitation. The uterus is in the axis of the vagina (between fifty and sixty degrees to the horizon) and prone to slip almost directly downward.

Conditions are now changed; the uterus no longer produces the ball-valve action over the vaginal orifice; the pressure-bearing area behind the base of the ligaments is no longer counterbalanced by that anterior to it; but the combined force of the two sections represented by the units or the entire pelvic

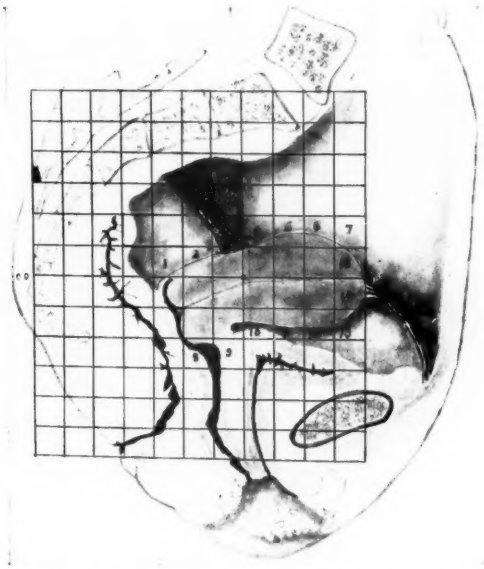


Fig. 4. Parts of the uterus exposed to pressure coincide with its peritoneal coverings. Its area on the lower pole is represented by units 1, 2, and parts of 0 and 3, while 4, 5, 6, and 7 stand for the upper pole, there being one unit excess on the latter.

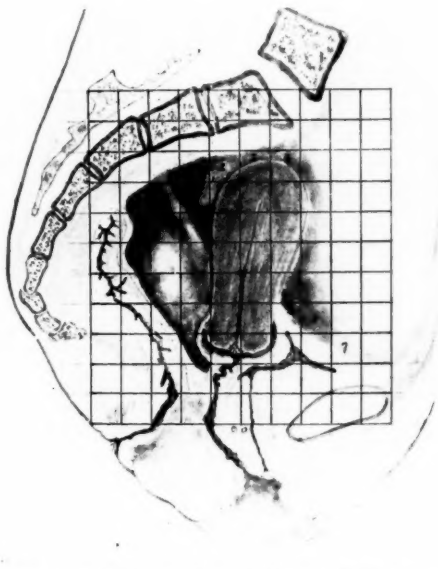


Fig. 5. Added to this is the strain of abdominal pressure, as indicated by all the units in contact with the peritoneum of the bladder, uterus, and Douglas' pouch (1, 2, 3, 4, 5, 6, and 7). The cumulative effect of these is an overburden far in excess of the normal 25 per cent.

area is applied directly to the bladder and anterior surface of the uterus as it lies in the hollow of the sacrum. Change in the tissue, such as softening from relaxation and venous stasis, interfere with nutrition and decrease resistance. The conditions are similar to those of the post-puerperal displacement, except for the effect produced by infection, inflammatory lesions, lacerations, etc. The mucosa, connective tissue, and fascia become œdematous; glandular secretions increase; infection is invited; the result is disease of the endometrium, glandular proliferation, round-cell infiltration, and hypertrophy of mucosa, or perhaps chronic metritis, fibrous deposits, atheromatous vessels, hæmorrhage, etc. The vagina becomes redundant and is thrown into folds; the anterior wall slips down in advance of the uterus and, forcing up the trigonum, passes beneath it into the ostium vaginæ; the lateral ligaments of the bladder become relaxed and, if the suspensory ligaments are much impaired, the neck of the bladder may rotate under the pubic arch in advance of the developing cystocele. The uterus becomes prolapsed, the uterosacral ligaments effaced, and the broad ligaments are subjected to excessive pressure. The inferior uteropelvic ligaments are now subjected to greatest strain and the round ligaments can offer no restraint until extrusion of the cervix occurs. At this stage the restraining force preventing extrusion devolves upon the overstretched broad ligaments and the peritoneum, and with little effect, for the full force of intra-abdominal pressure is measured at the vaginal orifice.

The posterior vaginal wall, coincidentally with the anterior, drops for a short distance, but it is retarded by its attachments to the rectum, and indirectly by its lateral ligaments, when they reach a line between the ischial spines. In this new location they become tense and, not being subjected to much pressure, act as a check on the descent of this part of the vagina. But on further advance these attachments feel abdominal strain and follow the uterus in its outward passage.

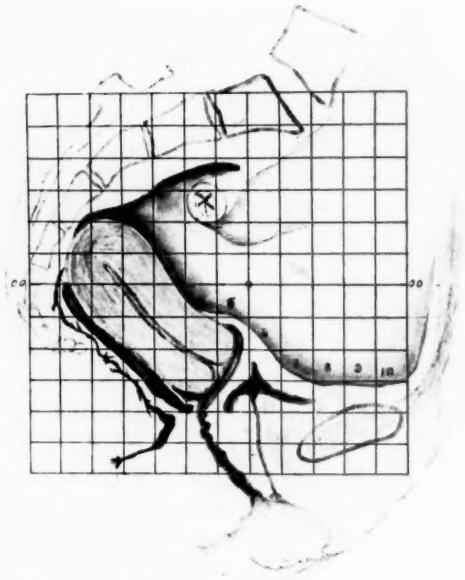


Fig. 6. Diagram exhibiting the retroverted uterus. In this position the units (1, 2, 3, 4, 5, 6, 7, 8, and 9) cover the entire pelvic peritoneum and indicate that the pelvic organs are subjected to the maximum strain originating in the abdomen. This strain is augmented in the erect position by gravitation.

So much for the effects of pressure upon the ligaments of the uterus in ordinary circumstances; but now let us turn to the consideration of cases having their origin in lesions of the floor of the pelvis.

The perineum may be likened to the center stone in an inverted arch, but in place of a crushing force it sustains a tensile strain. The decussating fibers of the levator ani muscle attached to the anterior surface of the anal segment of the rectum, the rectovesical fascia, and the triangular ligament (constituting the most important parts of the perineum) act as a bond holding the two halves of the levator ani muscles together between the rectal and vaginal outlets. Pressure tests show an average of 80 mm. in the abdominal cavity, 60 mm. beneath the cervix, 40 mm. on the inside of the perineum, 20 mm. on its external surface before it reaches full distention, and zero when bulging is complete. Therefore it will be observed that the perineum sustains 40 mm. of pressure, and actually bears two-thirds of the burden measured beneath the cervix, or 50 per cent of abdominal strain. But *when the perineum is destroyed pressure tests show full intra-abdominal strain at the vaginal orifice.* The reason for this is that the two sides of the levator muscles separate, the abnormally large vaginal orifice offers no resistance, and the pelvic organs are held by their ligaments and other suspensory attachments only (the support below being removed). Normally the levator muscles draw the perineum forward and beneath the bladder until the posterior commissure reaches the trigonum, which covers the outlet like a lid to a box. In lacerations of the perineum this effect is lost. The loose portion of the vesicovaginal septum posterior to the trigonum (that part in which the connective tissue permits the bladder to move easily on the vagina) slips forward and, becoming more or less œdematous, passes beneath the trigonum and protrudes from the vagina. As it develops it draws the neck of the bladder and the uterus downward. If the rectal sheath has been torn when subjected to elongation, coincidentally with distention of the perineum in labor, or if meshing of its fibers has occurred, the rectum rolls forward and outward for the lack of perineal support, as the thin walls of the rectum are unable to sustain the intrarectal pressure, which at times is equal to the abdominal. When dealing with lacerations we must not be unmindful that they are frequently associated with puerperal infection. Inflammatory softening is not confined to the uterus, but it involves the ligaments and arrests the process of involution; they become relaxed and incapable of supporting the uterus. It lies in the hollow of the sacrum; consequently this class of cases frequently begin with retroversion. They, however, follow a similar course to those described, except that changes take place more rapidly and, there being a greater relaxation of fascia, the rectum is disposed to slip forward in advance of the cystocele.

It is not the purpose of this paper to deal with cases having their origin in new growths and other specific pathological lesions, nor is it intended to account for the influence of adhesions to the uterus, etc.

EXPERIMENTS ON THE TRANSPLANTATION OF GASTRIC MUCOUS MEMBRANE

By WILL DOOLIN, M.B., F.R.C.S.I., Dublin, Ireland

THANKS to the rapid advances made in plastic surgery within the last ten years, every day new tissues are becoming serviceable for purposes of free transplantation. At the same time the possibilities of the various tissues for this purpose have been exhaustively investigated by thorough and patient experiments upon the living animal, with the result that today we have a very definite idea of the value and the limits of such transplantation in the individual tissues, such as fat, bone, skin, etc.

The latest tissue to be investigated in this manner and for this purpose is the epithelium lining parts of the alimentary canal and the ureters, which was first utilized as transplantable material by Lexer (1), Streissler (2), and Schmieden (3). Lexer, in 1910, in a case of traumatic stricture of the urethra, due to fracture of the pelvis, successfully transplanted the sound appendical mucosa of the same patient in place of the excised stricture. Steissler, in 1911, in three cases of peniscrotal hypospadias, used an homoplastic transplant in the attempt to form a new urethra. Schmieden, in 1909, attempted in 3 similar cases, to form a new passage for the urine with homoplastic grafts of ureteric tissue. Lexer would appear to have had at least one satisfactory result. The attempts of the other two workers were either partly failures, or else the patients did not remain sufficiently long under observation. Hence it is, that from these very few reported cases (not one of which was watched to a definite conclusion), we have no clear knowledge of the procedure which takes place when the mucosa of hollow food-carrying organs is transplanted upon new soil. And further, in these cases, too, for obvious reasons, we have no histological picture which could have given us so much information as to the ultimate fate of the epithelial lining of the newly formed passages. The animal experiments of both Streissler and Schmieden failed to produce any accurate information on the subject.

Axhausen (4) was the first to establish definite experimental proof of the possibilities of transplantation in the gastric mucosa within the abdominal cavity of dogs. His experiments were made in three parallel series, to determine the relative values of autoplastic, homoplastic, and heteroplastic grafts; for the last named, rabbits were used. Pieces of the stomach-wall were excised, the mucosa stripped off, washed in sterile, physiological saline solution, then stretched on the peritoneal covering of either the stomach or urinary bladder and there fixed with catgut sutures in such wise that in alternate cases the mucosa graft was lain either "face up" or "face down" on the surface of the organ to which it was attached. The heteroplastic experiments were completely negative in result. Of the other two series twenty-six experiments were carried out—sixteen autoplastic and ten homoplastic.

As regards their condition after implantation in the same or in a second individual, the results were strikingly uniform, showing in a marked manner the differences between the autoplastic and the homoplastic grafts. The homoplastic grafts underwent necrosis throughout, with the exception of scattered portions of the muscularis mucosæ; these portions were surrounded by and infiltrated with granulation tissue growing in from the immediate vicinity, which was in process of absorbing the necrosed material so that the whole presented the picture rather of a fibrous callus. Of the transplanted vesical mucosa (which possesses no muscularis mucosæ) nothing remained at the site of transplantation save a few omental adhesions to remind us that living tissue had been planted there.

Very different were the results attained in the autoplastic experiments. In every case the mucosal graft had developed into a cyst, of greater or smaller size, in direct proportion to the length of time which had elapsed since transplantation. The cysts were formed in the following manner: In those cases where

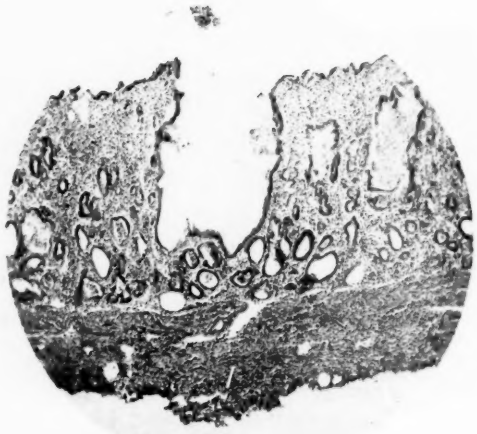


Fig. 1. Experiment 1. Duration eight days. Muscularis well preserved. Superficial epithelium necrotic. Deeper epithelial layers well preserved, and growing out in single-covering layer over necrotic portions, to form a one-layered lining for the cavity. The graft is at the pylorus, with mucosa "face downward." Obj. 3, oc. 1, x 50.

Fig. 2. Experiment 8. Duration four days. Pylorus: mucosa facing downward. Islet of epithelial cells remaining living at the one corner and proliferating in a single layer beginning to line the prospective cyst-cavity. Obj. 3, oc. 1, x 50.

the mucosa had been planted "face downward" (i. e., with the epithelial surface facing the stomach-wall) it had raised itself up from the under layer, and so formed one wall of the cyst, the opposite wall of the cyst consisting of the stomach or bladder-wall upon which implantation had taken place. In the cases where the mucosa had been planted "face upward" (i. e., with the epithelial surface facing the peritoneal cavity) omental adhesions had grown over the transplanted tissue and, in common with it, also produced a cystlike structure. All these cysts were tense and filled with fluid.

Of the transplanted mucosa complete layers were thoroughly well preserved, conforming in their epithelium, glands, connective tissue, and muscularis mucosæ to the normal type of gastric mucosa. Each cyst was lined throughout with a single layer of cubical epithelium, derived, apparently, from the subsequent growth of the transplanted mucosal epithelium.

The questions which naturally arise out of this experimental evidence can be formulated somewhat as follows: (1) Whence does the surviving graft tissue derive its nourishment? (2) Does the whole of the transplanted mucosa take part in this cyst formation, or only a part thereof? (3) And if the latter, which part, then?

The first suggestion that occurred to us was that the nutrient material was enabled to effect its influence from the free surface of the mucosa upon the transplanted tissue, and hence to keep the superficial epithelial cells alive, from whence further proliferation might take place; or the blood-supply to the graft might have come from the site of implantation, working its way through the muscularis mucosæ, and in this way allowing the superficial epithelial cells to die, whilst preserving the deeper layers. The decision of this point seemed to us to be essential, in regard to the further practical application of these experiments, such, for instance, as the formation of tubular grafts of mucosal tissue in further researches in plastic surgery; in such cases, then, one would naturally be led to turn the epithelial surface of the graft outward, if one could establish the fact that the nutrition and preservation of the graft was best accomplished by this means, and *vice versa*.

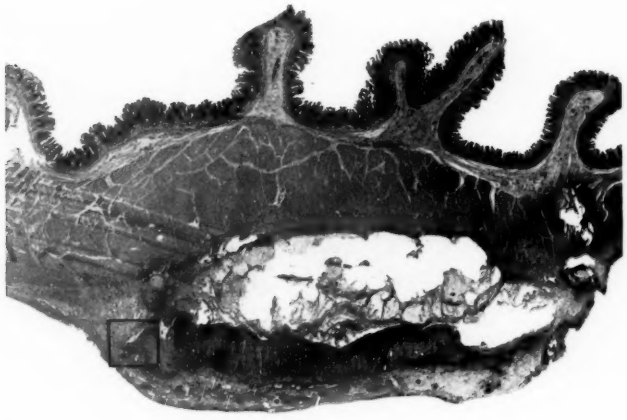


Fig. 3. Enlargement x 4. A low power view of Fig. 2 to show the point of union and the solitary remaining islet of living epithelium at this point.

Finally, there was a third possibility to be taken into consideration; viz., that at the cut edges of the transplanted piece of tissue rapid union of the graft with its surroundings would have permitted of the earliest possible access of nutrition to the grafted portion. In this case, then, the mucosal epithelium must possess extraordinary proliferating power to have brought to pass within such a comparatively short space of time the complete lining of the cyst wall, as observed in Axhausen's experiments. In addition to the determination of these questions it appeared to us, in view of the surprisingly favorable results of Axhausen's experiments, of the greatest interest to determine if similar results (i. e., preservation of epithelium and possible cyst formation) were to be attained only in the situations chosen by him (i. e., abdominal cavity), or else if it were possible to obtain these results on implantation of the gastric mucosa elsewhere in the living organism. Only in this manner could a foundation be laid for the practical application of these experiments in man. Since cysts with a complete epithelial lining were observed in Axhausen's earliest attempts, even after so short a period as twenty-five days, it behooved us to make even earlier interruptions, experiments of shorter duration, if we wished to determine the genesis of these cysts. Only in this manner could we accurately determine how much of the graft remained living before proliferation from this remaining portion had obscured the picture.

In our endeavors we used twenty dogs in the following manner. The Axhausen operation was carried out on five and "interrupted" after intervals of two, four, six, eight, and ten days. In these only autoplastic transplantation was carried out. The procedure was simple, and as follows: Morphia and open ether narcosis; laparotomy; a piece of the anterior stomach wall (about 5 sq. cm.) was resected in its entirety, and the mucosa stripped off; this was divided into two pieces, of which one was stitched with interrupted catgut sutures, "face downward," at the pyloric end of the stomach, and the other fixed similarly "face upward" at the cardiac end (i. e., with the mucosal surface facing the peritoneal cavity). The wound in the stomach wall was then carefully sutured in three layers (mucosa, stitched by continuous catgut suture, musculoserous coats, by continuous silk, and the whole covered by interrupted silk Lemberts). Laparotomy wound then closed in layers. As each procedure was carried out under the strictest aseptic precautions, healing took place by the first intention, and

Fig. 4. Experiment 2. Duration six days. Pylorus: mucosa facing downward. A further state than Figs. 2 and 3. Strong proliferation of surviving graft epithelium, growing out in one layer to line cyst-cavity. Obj. 3, oc. 1, x 50.

we lost not a dog from peritonitis. With one exception, all the transplanted portions attained firm union at the site of implantation in their whole periphery, appearing either reddish grey in color, or else brown to black, due to hæmorrhagic coloring matter. The exception was that of a four-day experiment, in which, owing doubtless to faulty stitching, only one-half of the graft had united with the stomach-wall. On section there was always, between the transplanted tissue and the stomach wall on which the implantation had taken place, a cavity of greater or less dimensions to be found.

The first glance through the microscope disclosed a not very hopeful picture. The greater mass of the epithelium and of the muscularis mucosæ had taken up none of the staining material, and so had to be regarded as necrotic. Numerous red blood-corpuscles lay between the gland-tubes, and likewise numberless white cells had assembled for the purpose of absorbing the dead tissue. Similarly the muscularis was everywhere liberally interspersed with "wander" cells. In no section, however, was everything dead. In each, alongside the preponderating necrotic areas, were some epithelium and some muscularis remaining in a state of preservation, varying in extent according to the favorableness of the circumstances in which the graft found itself.

As far as the pyloric ("face downward") grafts were concerned, we could differentiate two types of tissue conservation. The first type showed the most favorable results. (Experiment 1. Duration eight days. Microphotograph 1.) Nearly the whole of the muscularis was preserved, and above all a very large amount of epithelium, notably the deepest layers; the more superficial epithelial cells were necrotic, as we are accustomed to seeing in the ordinary skingrafts, but the deeper layers were still living and in process of active proliferation. In the accompanying microphotograph one can notice the numerous epithelial gland-tubes and observe how from out the depths this epithelium is proliferating and creeping in a single layer over the surface which was, for the greater part, necrotic. The preparation exhibits a similar process throughout practically its whole extent. Once these strongly proliferating cells effect a union on all sides and grow in from the corners over the opposing stomach wall, then the epithelial lining of the cyst is complete. A similar process, if not so perfect, was observed in other cases.

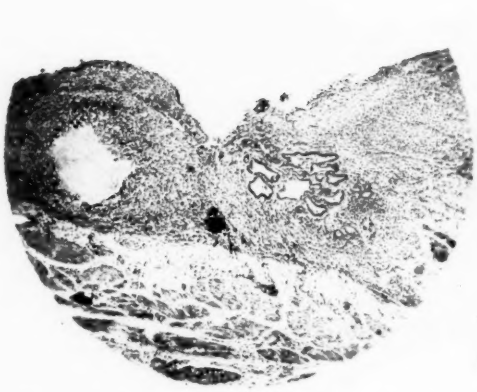
In the second type-group where less favorable circumstances were evident, the muscular coat and the greater mass of the epithelium were dead, there being living tissue preserved only at the edges of the graft. And here again one could recognize the marked inclination toward superficial expansion of the epithelium for the purpose of lining the cavity between the grafted tissue and its mother-site, which cavity, on account of the destruction of the large part of the mucosa, had attained greater dimensions. As example, we take Experiment 8 (duration four days, Figs. 2 and 3) and Experiment 2 (duration six days, Fig. 4).

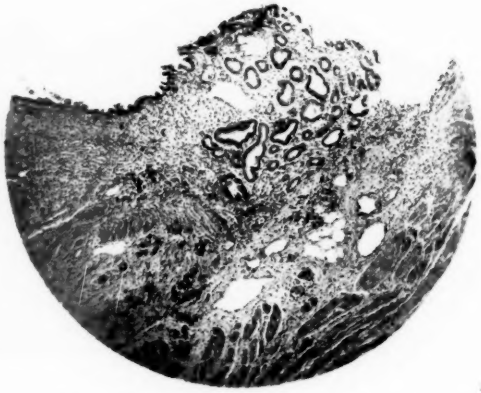
The section of the four-day experiment (see Fig. 3) shows with the low power a complete union with the ground layer only at one corner, and it is only at this corner that the epithelium and muscularis are preserved as is well seen with the high power (see Fig. 2).

Fig. 5. Experiment 4. Duration eight days. General picture (low power) of an eight-day cardiac implantation, where the mucosa faces the peritoneal cavity. The muscularis is as yet living, but the superficial epithelium is completely necrotic, save at the corners, where omentum had become adherent.

Here one can observe very clearly how, from the island of living epithelial cells, a single layer of these cells is growing out and beginning to line the cyst-cavity; the same can also be observed in the six-day section (see Fig. 4). In this latter the same arrangement is to be found at both corners, as adhesion had taken place along the periphery of the whole graft. Here, too, the actual cyst formation is easy of comprehension, owing to the vigorous living epithelium and living muscularis to be found; while in the cases where the omentum was adherent to the edges of the graft, it was only at these spots that living growing tissue was to be recognized. Young connective tissue with numerous fibroblasts formed the hedge between the omentum and the transplanted tissue, and the rich supply of capillaries which this connective tissue had formed constituted the active conduit for the blood to the transplanted tissue.

This union of the graft with the omentum, therefore, is the necessary condition for its preservation; and, further, such union must be a sufficiently rapid one, for, in the case where, coming from the corners, the omentum spread later over the surface, it came too late, to find necrosis already set in, as the *vita propria* of the epithelial cells was already exhausted. Hence, we can readily comprehend why, with the grafts whose mucosal surface was turned outward, we never found the first-mentioned type-group where almost the whole of the transplanted epithelium and muscularis remained in the living state. In these cases the nutrition-carrying omentum could gain no hold on the uninjured epithelial coat. The omentum was found adherent only at the edges of the graft, and in every case in this situation. There, too, wherever omentum was found adherent the grafted epithelial and muscularis cells were found well colored: that is, living. The later growth of the omentum over the flat surface of the graft came in each case too late to preserve the life of the exhausted mucosa. As an example we take Experiment 4, duration 8 days (see Figs. 5 to 8). Figure 5 shows a general picture of an eight-day cardiac implantation. Figures 6 and 7 show the two corners with the islets of living epithelium, which in Fig. 7 can be seen to be in active growth across the surface. As in the other preparations, the young connective tissue of omental origin is easily recognizable at the point of junction with the edges of the graft. Figure 8 is also from the same experiment; the section has been taken from about the middle of the preparation, and shows a flat layer of serosal cells in active growth across the surface of the graft. These two component parts—the living islets of proliferating epithelium at the corners and the omental tissue growing over the surface—constitute, with the stomach-





Figs. 6 and 7. Same experiment as 5, showing a high power picture of the two corners, where the junction with omental tissue effected a preservation of islands of still living epithelium. In Fig. 7 the actual overgrowth of the living cells over the necrotic portions can be well seen.

wall opposite, the cyst, in the following manner: the epithelium pushes in between the stomach-wall and the omental layer and lines the hollow space between both layers.

If we sum up once more the results of our examinations, we find that the transplanted tissue was to be found in a good state of preservation only where firm and rapid union had taken place with the omentum; hence this latter must be looked upon as the source of nourishment. This necessary adherence of omentum to transplanted tissue appears to take place best at the cut edges of the graft, for we find it in this situation in every case, without exception. Further, we always found a marked tendency on the part of the surviving tissue toward expansion in a single layer over the surface, and so strong is the proliferating power of the epithelium that the actual preservation of relatively small portions of tissue promised the successful accomplishment of the complete lining of the cavities with epithelium, as is to be seen in the longer experiments of Axhausen. We are, accordingly, after our experiences, driven to the conclusion that in his cases, too, the cyst lining developed even out of such small cell-rests as ours. With regard to the practical application of the free transplantation of intra-abdominal mucous membrane, i. e., the autoplastic formation of tubular grafts, transplantation with the epithelial surface facing inward alone comes into consideration, since in our experience union of the undamaged epithelial coat of an outer mucous surface with the surrounding tissues takes place either not at all, or else after so long a time that the transplanted epithelium has already undergone necrosis. But even where the mucosa is turned inward it appears to us at least questionable whether the free cut edges of the graft, which afford the most speedy adhesion and hence the best route for nourishment, on being sewn together to form a tube, would not of necessity prejudice this union with the surrounding tissues. Further, it seemed doubtful to us whether other surroundings, such, for instance, as the soft subcutaneous tissues, would have the same powers of nutrition and preservation as the omentum for such a very sensitive tissue as the mucous membrane.

To determine the practical possibility of this suggestion we made twelve experiments. The mucous membrane was obtained as before and cut into rectangular strips, the long borders of which were sutured with continuous silk to form a tube. The sites of implantation

chosen for the experiments were the spleen and the subcutaneous tissue of the breast. A way was bored with a broad trocar through this soil, the mucous tube implanted, and fixed at each end with a catgut suture. (Two of our dogs died shortly after operation from unavoidable internal hæmorrhage.)

The result of these experiments was uniformly negative. There was never even a trace of mucosal epithelium to be found on section. The canal formed by the muscularis mucosæ, however, was maintained in many cases surprisingly long and well, thus demonstrating the much higher resistance of this tissue.

Our attempts in this line, therefore, do not lead us to expect much from this particular technique in the formation without the abdominal cavity of a tubular transplantation of gastric mucosa. The practical desirability of a successful procedure of this nature occurs to one in connection with the question of some plastic operation for the relief of malignant disease of the œsophagus. We can, therefore, only explain Lexer's successful transplantation of the appendix in one of two ways: Either that the conservative powers of the mucous membrane are stronger in man than in the animals utilized by us for experiment, or else, as seems to us much more likely, that the appendicular muscularis mucosæ probably preserved the lumen of the tube, which was later on lined by the urethral mucous membrane growing down into it.

The actual determination of this point, however, must remain *in suspenso*.

CONCLUSIONS

1. The autoplastic transplantation of gastric mucosa in dogs is feasible, and leads to definite cyst formation.

2. These cysts are lined with a single layer of cubical epithelium arising from epithelial islets which have survived the general necrosis of the graft.

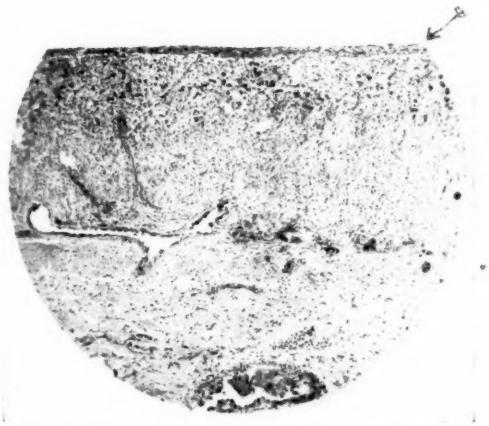


Fig. 8. Shows flat layer of serosal (omental) cells in active growth across the surface of the graft.

3. The graft depends for its nutrition upon the blood-supply conveyed to it by adhering omentum.

4. The size of the cyst so formed varies directly with the length of time since the operation.

5. Tubular grafts of hollow abdominal mucosal tissue depend for their success upon their muscularis — the canal being later lined with epithelium growing in from the surroundings.

In conclusion I have to express my gratitude to Professor Doctor George Axhausen of the Surgical Clinic of the Charite, Berlin, for permission to carry out these researches in his laboratory, and to his assistants, Dr. Karl Reschke and Frl. Seiffert, for much help in the various operative procedures.

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DISLOCATION OF THE SEMILUNAR BONE[1]

With a Report of Eight Cases

By R. W. RUNYAN, M.D., Ancon, Canal Zone

THE eight cases comprising the series on which this paper is based were treated in Ancon Hospital and include all of the cases of the past six years. This period covers approximately one hundred and twenty thousand admissions to the hospital, which might lead one to believe that dislocation of the semilunar is an extremely rare occurrence. A better index of its relative frequency may be obtained by comparing it with other forms of traumatism. During the three-year period from 1910 to 1912, inclusive, about eleven thousand, six hundred and fifty traumatic cases were treated, and of this number there were sixty-seven dislocations of all kinds, eighty Colles' fractures, and six carpal injuries, one-half of the latter being dislocations of the semilunar. Codman and Chase[2] reported a series of twelve cases and called attention to the not infrequent occurrence of dislocations of the semilunar. The cases in this series, unlike theirs, were all recent injuries, and it is thought advisable to report them in detail.

Etiology. The population of the Canal Zone is predominantly male, and our patients were all adult males. Half of the patients were in their third decade, and the remainder were equally divided between the fourth and sixth decades. The youngest was twenty years old, the oldest fifty-four. Five of our patients were black West Indians, two were white Americans, and one was a Spaniard. This is about the relative proportion of the different races. In five instances the left wrist was affected, and in three the right. Half of the injuries were due to indirect violence from falls upon the outstretched hand, while the others resulted from heavy blows upon the dorsum of wrist.

Pathology. Codman[3] has demonstrated that the articulations above and below the proximal row of carpal bones account for all of the mobility of the wrist in both extension and flexion, and that each group of articulations is responsible for ninety degrees of motion. In either complete flexion or extension the axis of the os magnum forms an angle of ninety degrees to the long axis of the radius, while the interposed semilunar forms an angle of forty-five degrees with both bones. In this position the semilunar is at a mechanical disadvantage, because only the narrowest part of it is in the axis of force, and any increase of the tension beyond the normal has a tendency to squeeze it out of place. This does not occur, however, except in hyperextension (due probably to the greater strength of the ligaments attached to the anterior horn), and the dislocation is invariably anterior with the concave articular surface of the semilunar facing either forward or downward.

Symptoms. An accurate history of a severe traumatism usually can be obtained, and the direction and kind of force determined. The injury almost immediately has been followed by the most intense pain and total disability of the affected wrist. Swelling and ecchymosis rapidly appear. On examination it will be noted that the swelling is very marked and more or less limited to the radial half of the wrist. The fingers are maintained in a position of partial flexion, and any attempt to move them causes severe pain. The rigidity of the wrist and fingers is much more marked than in a Colles' fracture of ordinary severity. There is slight silver-fork deformity. If the swelling is not too great, an enlargement can be detected on both the anterior and posterior surfaces of the wrist. The former is the dislocated semilunar under the flexor tendons, while the latter is the head of the os magnum, made much more prominent by its approximation toward the head of the radius. Immediately above the prominence of the os magnum there is a depression due to the absence of the semi-

[2] Codman and Chase, Ann. Surg., Phila., xli, 1905.
[3] Codman, Boston M. & S. J., 1904, cl.

[1] From the Surgical Clinic of Ancon Hospital. Read before the Canal Zone Medical Association, June 20, 1914.

Case 2. Upper picture, August 14, 1912; lower picture, February 28, 1912.

Case 3. December 4, 1912.

lunar from its normal position. The apparent shortening of the palm on the affected side, upon which Codman and Chase place so much reliance in diagnosis, we have not noted. This probably was due to the fact that all of our cases were recent, and the condition, if present, was obscured by the swelling; or it may be that the atrophy from disuse in long-standing dislocations accentuates the condition, making it much more noticeable than in recent injuries.

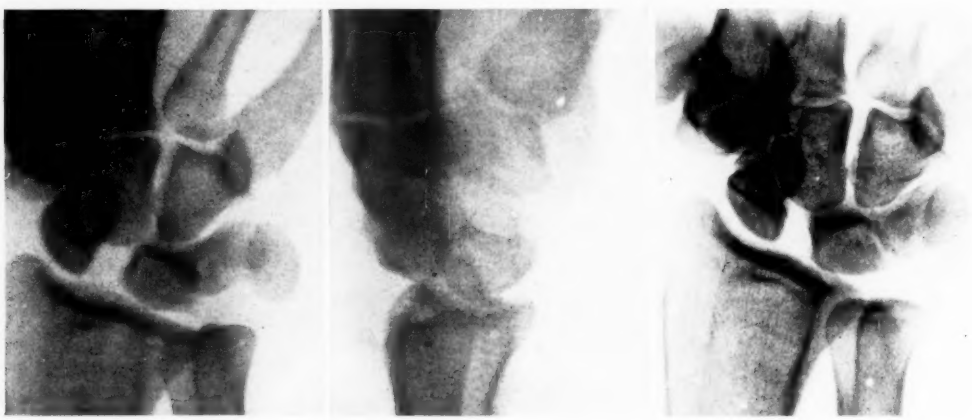
Diagnosis. The provisional diagnosis in a great majority of the cases will probably be Colles' fracture. It requires a very careful examination to exclude Colles' fracture, but it will be found that the relative positions of the radial and ulnar styloids remain unchanged; there is no crepitus unless there are complications. The circumference of the affected wrist is increased, but this may be due entirely to the swelling. The combination of marked swelling, spasm, and prominences on both anterior and posterior surfaces of the wrist, slight silver-fork deformity, with no change in the position of styloid processes, furnishes sufficient data to make a diagnosis. To obtain accurate information of the condition present, to exclude a Colles' fracture, and to ascertain definitely that there are no other fractures or dislocations present, requires an X-ray examination, and upon this the ultimate diagnosis must depend. The X-ray examination should include several views, both anteroposterior and lateral, as a dislocation may be overlooked in the former.

Prognosis. Judging from the limited number of cases we have had under observation, the ultimate result in any given case is difficult to forecast. Much will depend upon the kind of injury and whether there are complications. A Colles' fracture is the most severe complication that we have seen, and has always resulted in partial disability. Without gross complicating factors, and other things being equal, it seems that dislocations

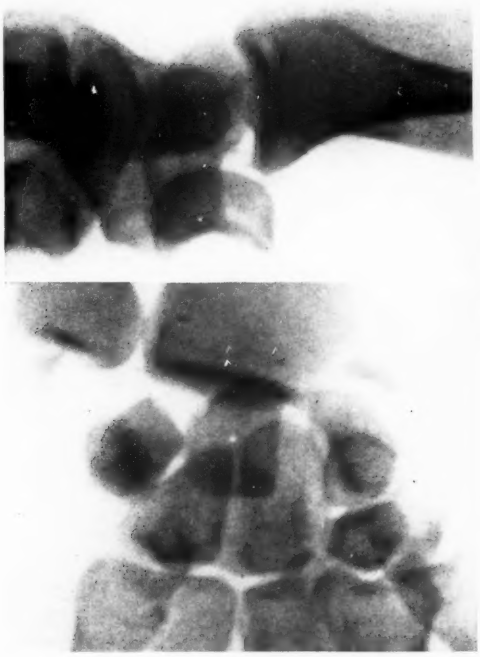
Case 4. March 3, 1913. March 3, 1913. May 17, 1913.

resulting from indirect violence are much more favorable than those caused by direct trauma. This is due, no doubt, to absence of severe tendon injury, which is always present in those cases resulting from blows upon the dorsum of the wrist. Prompt diagnosis and the early administration of proper treatment, of course, increase the probability of a good result. Perfect functional recoveries are not common, though a fairly serviceable hand can usually be obtained with proper treatment.

Treatment. We have attempted closed reductions in the seven simple dislocations and have been successful three times. The method of reduction which we have employed is the same as that recommended by Codman and Chase, and consists of traction upon the hand and hyperextension of the wrist; and while counterpressure is made over the dislocated bone on the anterior surface of the wrist, the hand is brought over into complete flexion. Should this procedure fail, it is necessary to cut down upon the semilunar and either reduce or excise it. Of the five open operations, two were reductions and three were excisions. In no case have we



Case 5. March 28, 1913. March 28, 1913. April 1, 1913.



Case 6. October 3, 1913.

Case 7. June 23, 1913.

excised any part of the scaphoid. An anterior incision between the flexor tendons of the wrist has been used in all instances.

Case 1. G. M., Barbadian, age 21; injured by falling down hill and striking upon outstretched hand, January 2, 1908. Admitted to hospital the next day and was found to have a compound Colles' fracture and a dislocation of the semilunar. One week later the semilunar was removed and the reduction of the fracture attempted. This was only partly successful, and he was discharged three months later with marked impairment of all movements of the wrist.

Case 2. E. G., Spaniard, age 35; entered hospital February 28, 1912; had been injured the day previous by being struck upon the dorsum of wrist with a heavy dump-bucket. The X-ray examination made the day after admission showed a dislocation of the semilunar, with its concave surface directed downward and forward, and a fracture of the scaphoid. Closed reduction March 4, 1912. X-rays made on March 30 and August 14, 1912, show that the semilunar had been reduced, and in the latter photograph the scaphoid seems to have united. The result in this case was poor, as there was decided limitation of both flexion and extension.

Case 3. A. H., white, American, age 37. On December 4, 1912, had been struck on dorsum of wrist with a heavy piece of timber. X-ray taken on the same day immediately after admission shows a fracture of the ulnar styloid, and a dislocation of the semilunar with the concave surface facing downward. Two days later closed reduction attempted, but was not successful. An open excision of the semilunar was performed on December 10, 1912. Was discharged from hospital three months after the injury, and had only about one-half the normal amount of motion in the wrist. He was able, however, to return to his occupation, that of a structural iron worker.

Case 4. E. P., Barbadian, age 20; admitted to Hospital March 3, 1913. On the day of admission some heavy machinery had fallen and struck him on dorsum of wrist. X-ray demonstrated a fracture of the scaphoid, dislocation of the semilunar, and a fracture of one of the distal carpal bones, probably the os magnum. Failure of reduction, March 6, 1913, was followed two days later by an open reduction. X-ray examination on May 17th shows that the semilunar had been reduced, that the scaphoid had not united, and that the fragment of the os magnum previously noted had been displaced posteriorly during the operation. The patient was

Case 8. April 8, 1914.

discharged one week later, and at that time had marked limitation of motion in wrist. Several months later he had but the slightest impairment of function.

Case 5. P. C., Jamaican, aged 27; admitted March 28, 1913. Injury received the day of admission, by falling off of steam-shovel, striking on extended right hand. X-ray made immediately showed an uncomplicated dislocation of the semilunar, with concave articular surface facing almost directly downward. Closed reduction on April 1, 1913, and X-ray of same date showed semilunar in place. This patient was discharged ten days later at his own request but against advice. The result was perfect, there being no limitation of motion in any direction, and he returned to work as a laborer.

Case 6. L. G., Jamaican, age 26; admitted immediately following injury, September 17, 1913. Fell while running, striking upon extended left hand. X-ray of the same day confirmed the diagnosis of Colles' fracture, but the dislocation of the semilunar was not recognized until two weeks later, when another picture was made. Closed reduction being impossible, an excision was done October 6, 1913. The styloid of radius could not be held in position very well. Function of wrist was so limited that passive motion under ether was given October 20th, and again on November 11th. Discharged three weeks after the last operation, with very limited motion in wrist.

Case 7. J. B., white, American, age 53. Injured by falling on extended left hand, June 23, 1913. Entered hospital the same day, and the X-ray revealed a fracture of the scaphoid, and a dislocation of the semilunar, with concave articular surface directed downward. Three days later closed reduction was done. Patient was discharged one month after injury, at which time he had a perfect functional result, there being no limitation of motion in any direction.

Case 8. A. B., Martiniquan, negro, age 54; had been injured by a bar of iron falling upon dorsum of wrist, March 26, 1914. He entered hospital the same day. The X-ray machine being out of order, it was impossible to have an examination made until April 8, 1914. Dislocation of the semilunar had been the provisional diagnosis, and this was confirmed by the X-ray. There was no other injury to the bony structures, but there was marked contusion of dorsum of wrist. Three days later an open reduction was done after an unsuccessful attempt at closed replacement. He was discharged seven weeks after injury. He had slight limitation of flexion and marked limitation of extension, but there was no interference with either adduction or abduction.

SUMMARY

In this series there have been two uncomplicated cases of dislocation of the semilunar. The first of these (Case 5) was reduced without open operation four days after its occurrence, and a perfect functional result was obtained. In the other (Case 8) it was necessary to perform an open reduction sixteen days after the injury, and the present result is poor. The marked difference in the results in these two cases would seem to be due to the difference in the kind of force causing the injury. In the former the injury was due to indirect violence; in the latter there was a severe tendon injury caused by a direct traumatism to back of wrist. The operative interference necessary in the latter case could hardly have caused the difference, for there is scarcely any limitation of flexion, the disability being entirely due to loss of extension. The delay in the treatment of the injury may have had its share in increasing the loss of function.

There were two cases of dislocation of the semilunar complicated by fractures of the scaphoid. They both were promptly recognized and closed reductions were done, yet the ultimate results were very dissimilar. The first (Case 2) was a poor result, even though the X-ray shows that there is appa-

rently good union of the scaphoid in perfect position. The second (Case 7) is one of the two perfect results in our series. Unless the form of violence causing the injury is the determining factor in the ultimate result, it is difficult to explain such diametrically opposed terminations in these two cases, which were in every way counterparts of each other.

The two cases complicated by Colles' fractures were the poorest results that we obtained. One (Case 1) was a compound fracture, the other (Case 6) a simple fracture. In both, the semilunars were excised. I believe that the poor results obtained were due to a combination of the fracture and the excision. In the first case it probably would not have been possible to treat it in any other manner than that which was used, but I believe that the second one might have been improved materially by open reduction of the semilunar and fixation of the displaced styloid process of the radius by means of a small nail or pin. We were unable to retain this fragment in good position by any other means, but had it been fixed it would have been possible to use passive motion, as we have done in the uncomplicated cases.

In the only case complicated by fracture of more than one of the carpal bones (Case 4) a good functional result was obtained ultimately, in spite of the fact that the scaphoid did not unite. The displacement posteriorly of the small fragment of the os magnum apparently did not affect the outcome.

The remaining case of our series (Case 3) was complicated by a fracture of the ulnar styloid. It was impossible to reduce the dislocation without an open operation. Reduction could be accomplished by an incision, but the semilunar had a tendency to redislocation, so that an excision was done. This resulted in a fairly serviceable hand, although flexion and extension were limited to about one-half of the normal.

Grouping the cases according to the method of treatment, it will be noted that of the three closed reductions two were perfect and one was poor; of the two open reductions one was fair and the other poor. The three excisions resulted very poorly in two instances, and only fair in the other.

CONCLUSIONS

1. Careful examination of all carpal injuries, and multiple X-ray plates, are necessary for diagnosis.

2. Closed reduction can be accomplished in about one-half of the recent cases by the method of hyperextension followed by flexion while counterpressure is maintained over the dislocated semilunar.

3. Prompt diagnosis and treatment are essential in obtaining good results. The more speedily the dislocation is recognized and reduced, the better the result.

4. Closed reduction should always be tried, irrespective of the length of time the dislocation has existed.

5. Closed reduction being impossible, an anterior incision should be made and the dislocation reduced. Failing in this, it is necessary to excise the semilunar, but excision should be done only as a last resort.

BENIGN TUMORS OF THE STOMACH[1]

By ALEXANDER MacKENZIE CAMPBELL, M.D., F.A.C.S., Grand Rapids, Michigan
Surgeon to Union Benevolent Association Hospital and Blodgett Home for Children

THERE has been so much attention directed toward the study of malignant tumors of the stomach that the benign form has been somewhat neglected. In the preparation of this paper we have endeavored to review the world's literature on this subject, which has appeared during the last fifteen years. The extreme rarity of the reported cases is surprising, and many clinicians of wide experience have never observed a case in either a living person or one on the post-mortem table. At the present time with our advanced ideas of the chemism of the stomach, with our knowledge of gastroscopy and our observations with the röntgenoscope, and with surgical asepsis making it possible to explore the stomach surgically with a minimum degree of hazard, it is to be expected that many more cases of benign tumor of the stomach will be reported from time to time. The importance of distinguishing between benign and malignant gastric neoplasms cannot be too much accentuated, for such a necessary organ as the stomach should always be treated with surgical conservatism, and radical resection has doubtless been performed many times where the character of the tumor did not require such a hazardous procedure.

It is interesting to note that the diagnosis of benign tumors of the stomach has rarely, if ever, been made before operation. They have usually been discovered as an accidental finding or at autopsy. Some idea of the rarity of the disease may be obtained by the fact that Alfred Tilger, (quoted by Myer) in thirty-five hundred necropsies reports but fourteen benign tumors of the stomach. In the Obuchow-Krankenhaus in seventy-five hundred necropsies, four cases of polyps of the stomach were found. In the Russian hospitals, Tilger found the percentage to vary from .007 to .04 per cent. Vegele, in 1908, reported one case of polyadenoma, and, in a search of recent German and English literature, was able to find a treatment of this subject in the works of Collier, Hanser, Post, and Galland. In French literature Menetrier, Brissard, and Norman have each reported cases.

These tumors may develop in any part of the stomach and may form on either the inside or the outside of the wall, varying in size from a pea to a baby's head. They may rise from any of the three coats of the stomach and may be either sessile or pedunculated, at times simulating carcinoma or sarcoma so closely that they cannot be differentiated except through most careful pathological examination. Some of them even metastasize with characteristics that simulate malignancy. The majority of cases occur in elderly people, although they may be found in younger individuals.

There are a number of different benign tumors associated with the stomach. Among the more important of these may be mentioned the myomata, fibromata, lipomata, adenopapillomata, and lymphadenoma. Other tumors which may be found are the myxomata, osteomata, hydatid cysts, serous cysts, blood cysts, aneurisms, and syphilitic gumma. The myomata are a common form of benign tumor of the stomach and about forty cases have been reported. Most of these cases, however, proved to be malignant, showing areas of fibrosarcomatous or myosarcomatous degeneration. Myomata may be single or multiple and are usually situated in the pyloric region, forming firm rounded tumors with a thin pedicle. They vary in size from a pea to a cherry and are composed of non-striated muscular fibers, arranged in a concentric manner, covered by a thin mucous membrane.

Lipomata are found in the submucous coat of the stomach. They may be the size of a pigeon's egg and seldom cause trouble, although they have been known to separate the muscular walls and form tumors of considerable size beneath the serous investment of the stomach. Occasionally, they originate

[1] Chairman's address read before the Surgical Section of the Michigan State Medical Society, September 12, 1914.

in the subserous connective tissue and may become very large and troublesome because of the mechanical displacement of the stomach. The lipomata are usually single and are found in the median portion of the stomach on the anterior wall. They are soft, lobulated tumors of yellow color, and with short, thick pedicles. The tumor itself consists of fat, with fibrous tissue covered by mucous membrane. They rarely become malignant.

The fibromata, like the myomata, are usually found in the pyloric portion of the stomach, and are either single or multiple. They are elongated and as a rule measure several inches in length. Microscopically, they may consist either of fibrous tissue or may be of a papillomatous nature. The myomata and fibromata are of interest because of the frequency with which areas of sarcomatous degeneration may be found. This may lead to a question as to their classification as benign tumors. However, the condition is usually limited, and their progress is neither rapid nor extensive.

Fibromatosis of the stomach has been the subject of an exhaustive discussion by Thompson and Graham. These writers claim to have cleared up a long-standing controversy as to whether fibromatosis of the stomach is innocent or malignant, finding that in some cases it is innocent and in others it is associated with cancer. They say that the condition known as fibromatosis may be limited to a portion of the stomach, or that it may extend throughout the entire stomach. The localized form almost always commences in the vicinity of the pylorus and spreads from there towards the cardiac end, usually showing a preference for the lesser curvature. In the majority of cases that were examined there was situated at about the center of the affected area, a deeply punched-out ulcer. Especial attention was devoted to the mucosa of the stomach and Thompson and Graham early suspected that a breach of the mucosa would be an antecedent of fibromatosis. Some authorities have suggested that fibromatosis is of syphilitic origin, but the majority of these cases show a negative Wassermann reaction. Thompson and Graham affirm most positively that fibromatosis may occur without the presence of cancer, although they note a most striking association which exists between it and ulcer. They have not seen fibromatosis in a stomach that was otherwise normal, and maintain that the changes in the mucosa are primary and that the fibromatosis is secondary.

A group of tumors which are of frequent occurrence are the adenomata. Pedunculated adenomata, when solitary, may reach a large size and may be either round, or smooth and lobulated. They are usually attached to the stomach in the pyloric region. When multiple, these tumors are not large and vary in size from a pea to a nut. The growth is rather firm and may contain several small cysts filled with mucus. Microscopically, there are found tubular glands supported by connective tissue and liberally supplied with blood-vessels. It is difficult to make definite limitations between simple adenomata and adenocarcinoma, since the structure may be very similar in the two cases, and death may result before the formation of metastases. In fact, it is also possible for a simple adenoma to take on malignant characteristics, and, excepting possibly lipomata, there is probably no other benign tumor of the stomach but what may become malignant. The polyadenomata are the tumors most frequently found to be of benign character. They are usually multiple, and as many as two or three hundred have been found in the fundus and middle of the stomach near the greater curvature. As a rule, the tumors are distributed evenly over the stomach, or they may be arranged in rows running parallel to the long axis of the stomach. The tumors are usually globular or lobulated, although they may be elongated. They vary from the size of a pea or bean to that of a nut. The color varies from pink to brownish gray. They are soft and spongy and contain considerable mucus. The center of the tumor consists of connective tissue, continuous with the submucosa of the stomach and containing lymphatics and blood-vessels, and over this a layer of non-striated muscular fiber representing the muscularis mucosa. The bulk of the tumor is made up of greatly

thickened mucous membrane. The gastric glands are provided with distinct basement membrane and are lined with cubicle and cylindrical epithelium. In the cysts the cells are rounded or vacuolated. Menetrier distinguishes two varieties, according as the ducts or the fundus of the gland is involved. In the former the tumor is distinctly lobulated and the cysts large and numerous. In the latter there is little or no lobulation and the cysts are either few in number or entirely absent. Menetrier classifies these tumors as *polyadenomes polypeux*, and *polyadenomes en nappe*. Of his second group only three cases have been reported, one by Andral and two by Menetrier. These are characterized by a distinctly limited thickening of the mucosa, two to five times the normal thickness. The consistency is soft, and throughout there are folds closely pressed together, running parallel with the long axis of the stomach. Hayem has described another type, the Brunerien adenoma. In this form the glands are of the duodenal type, probably arising from aberrant "anlage." This form is very rare, and is usually found ulcerated and partaking of an epitheliomatous or carcinomatous nature, although the process is limited and metastases are not found.

According to Fenwick, there are only three instances recorded of myxomata. Certain tumors, such as fibromata and sarcomata, undergo a partial ossification, and these tumors are known as osteomata. In the *London Medical and Physical Journal*, May, 1827, the following case was reported:

CASE 47. A man 62 years of age had suffered from pain after food, together with other symptoms of indigestion. One morning, when in fairly good health, he was seized with a violent pain in the epigastrium, accompanied by vomiting, thirst, constipation, and a quick pulse. The vomiting continued and death ensued about twenty-two hours after the commencement of the pain. At the autopsy the stomach was found to be considerably dilated and close to the pylorus there was an osseous, cartilaginous tumor the size and shape of a quart bottle cork, which was firmly attached by one extremity to the wall of the stomach, while the other projected into the pyloric orifice like a stopper.

A syncytiomatous tumor of the stomach was reported by Helmholz. This tumor was supposed to be a carcinoma, but the microscope did not show this and the examination showed a tumor neither carcinoma nor sarcoma. The metastases resembled carcinoma in that they passed along the lymph-channels, and sarcoma in that they traveled along the blood-stream to the liver, lungs, and spleen. Helmholz thought that the tumor might have arisen from a misplaced "anlage," and, because of the character of the cells, he called it a "syncytiomatous" tumor. Lymphadenoma may affect the stomach in the form of lymphoid overgrowth of the mucous membrane, and the stomach presents a number of sessile and polypoid tumors, which are chiefly situated at the cardiac orifice. In these tumors the mucous membrane is densely infiltrated with large and small lymphocytes which compress the gastric glands. Aneurism may be occasionally met with, and according to Powell, Sachs, Welsh, and Rassmussen, their rupture may produce fatal hæmorrhage. Hydatid cysts are extremely rare. Bachlendorf and Castelvi and Pelares each described a case. The only example of dermoid cysts that has ever been observed in the stomach was reported by Ruysch, in 1732. It consisted of a small tumor of the gastric wall which contained hair. Gray and Nesselrode report a case of desmoid tumor of the stomach. Serous cysts may occur between the muscular and serous coats of the stomach. They occasionally become pedunculated and sometimes muscular tissue forms in their walls. Blood-cysts may rarely be found in the stomach and a few cases have been reported. The tumors may be of large size and contain large quantities of mucous and pus-cells.

According to Fenwick, syphilis may affect the stomach in three ways: First, by the formation of gummata; second, by the production of endarteritis; and third, by exciting chronic inflammation of its mucous membrane. He states that gummata of sufficient size to attract attention are rarely encountered, and that only a few genuine cases are recorded in the literature on the subject.

Sherren has collected eighteen cases of polypoid tumors of the stomach attached to the outside. He states that these tumors

are mesoblastic and usually hang from the greater curvature of the stomach into the lesser sac, to which they may become adherent, and that they may also spring from the lesser curvature and may grow between the layers of the gastrohepatic omentum. They may be mistaken for ovarian tumors.

Benign tumors of the stomach may exist throughout life without evidencing any clinical symptoms. This is particularly the case with polyadenomata. Quite a number of such cases have been reported, the majority, however, having been found at the time of autopsy following death from other conditions. It is a curious and interesting feature that death has resulted in most of these cases from cardiovascular or renal conditions, and that associated with these tumors is often found a condition of chronic hypertrophic gastritis. A number of observers have considered that the disturbed nutrition of the gastric mucosa is an etiological factor in the production of these growths. This, however, has not been proved, for cases have been found in which gastritis was not present. It has also been suggested that the presence of cardiovascular conditions might be a causative factor in the growth of these tumors, but this is not probable. When these benign tumors are situated near the pylorus they may be provocative of most serious symptoms. Varying degrees of stenosis may be produced. Death may result from hæmorrhage or by ulceration through the stomach wall. Violent exacerbations of pain may be present during the active process of the digestion.

Wade describes a case of gastroduodenal intussusception in which, when the reduction was completed, a large pedunculated tumor was found in the pyloric antrum of the stomach. The invagination had originated here and the tumor had formed the apex of the intussusception. Microscopical examination showed the tumor to be a fibromyoma growing from the muscular coat of the stomach.

A polypus with a long pedicle may occasionally prolapse through the pyloric valve and suffer temporary strangulation, or the gastric walls may be perforated by these tumors. A case has been described by Beardsley where the patient vomited part of a gastric polypus.

The conclusions arrived at by Wade in the study of benign tumors of the stomach are well worth consideration and are as follows:

1. Benign tumors of the stomach are of occasional occurrence. The majority of these ultimately come to project within the gastric chamber and become pedunculated, forming gastric polypi.

2. These polypi, when situated adjacent to the pyloric antrum, ultimately produce occlusion of the pylorus by a ball-valve action.

3. This is indicated by the signs and symptoms of acute pyloric obstruction.

4. The obstruction is usually intermittent and the patient has intervals of good health.

5. A natural cure may result by a separation of the polypus from torsion or strangulation of its pedicle.

6. A fatal issue may ensue from complications as hæmorrhage, perforating ulcer, or profound debility.

7. A gastric polypus may produce a gastroduodenal intussusception.

8. When gastric polypi are diagnosed by their clinical indications or recognized by the polariscope in the region of the pyloric antrum, their removal by operation is indicated.

As illustrative of the pyloric obstruction produced, the following cases are of interest:

Spencer describes the case of a hospital nurse, age 46, who had suffered from abdominal trouble for some time, and had become so weak and anæmic as to be incapacitated for duty. The symptoms were partly referable to gastric trouble and partly to the fact that the kidneys were movable. She consulted another physician, who told her that in addition to the movable kidney there was a tumor in the epigastrium. At the first operation he fixed the left kidney and missed a third uniform tumor, or else confused it with the kidney. After the first operation, he could feel two uniform tumors. At a second operation, he fixed the other kidney in the loin, and discovered a third tumor which turned out to be a tumor in the stomach, and which was the size and shape of a large kidney. A microscopical examination of the tumor showed it to be a dense fibroma.

Benaky of Smyrna found at the post-mortem of a man aged 65 that the pylorus was so blocked by a tumor that when the water tap was connected with the cardiac orifice of the stomach and the stomach distended with water, no fluid escaped through the pylorus. This tumor was a submucous lipoma. Pernices met with a tumor the size of an egg, in a man aged 75, which had blocked the pylorus and had caused chronic dilatation of the stomach. Perrier removed from the pylorus a tumor the size of a cherry and the symptoms that had existed for a year disappeared.

Gibson presented the case of a man, aged 62, who was operated on for relief of gastric symptoms of some years' duration and consisting chiefly of progressive loss of strength and flesh. A probable diagnosis of carcinoma of the stomach was made. When the stomach was opened a small tumor was found attached to a pedicle an inch and a half long, which sprang from just inside the pylorus. This tumor had apparently intermittently plugged the pylorus, giving rise to pyloric obstruction. The patient made a rapid recovery.

Blake reports having operated upon a case where he found a pedunculated adenoma, which had produced an obstruction to the pyloric orifice.

Kammerer reports a case of a woman 53 years of age who had been under treatment since the preceding summer for gastric trouble, and had been under the care of various clinicians. She complained of all sorts of gastric disturbances, including sour taste, eructations of gas, vomiting, etc. She presented all the typical symptoms of pyloric stenosis. A blood examination showed between forty and fifty per cent hæmoglobin. A resection was done by which the entire lesser curvature and at least one-half of the greater curvature was removed. About one inch of the duodenum was also removed and a gastro-enterostomy was performed. A microscopical examination showed that the growth was purely fibrous. In the course of the operation two infiltrated glands were found underneath.

We desire to report a case of adenopapilloma of the stomach which presents some unusual features and which showed some characteristics that have not been observed in the literature upon this subject to which we had access.

On May 9, Mrs. M., age 51, wife of a retired farmer, was referred to us by her family physician for diagnosis. Her physician stated that it was absolutely impossible for him to make a diagnosis of her case. An examination of the patient showed her to be a woman well nourished, of average height, and weighing 140 pounds; her early history was negative; she stated that she had been free from any infections and excepting that she had for years suffered from a mild form of indigestion she had always been in perfectly good health. Her feeling of disability commenced two years before and since that time she had lost twenty-five pounds, had become very weak, tired easily, and was extremely nervous. In November, 1911, she was attacked with severe pain in the stomach which required an opiate to relieve it. She suffered from severe vomiting. The attack confined her to her bed for one week. She said that the pain seemed to start in the pit of the stomach. Another attack occurred in July, 1912, causing similar symptoms, and requiring an opiate to relieve it. Between attacks she was comparatively comfortable, excepting for some mild attacks of so-called indigestion. In September she had another attack similar to the preceding ones, and from that time until the time she consulted us she had had no severe paroxysms of pain. She came for consultation because of the fact that she was getting progressively weaker and losing in weight.

Physical examination. Patient well nourished, pulse 90, temperature 99°, bowels regular, tongue clean; examination of the lungs was negative, and tuberculin test was negative. Heart showed a mitral systolic with no observable hypertrophy, blood-pressure 140, slight tenderness over the epigastrium, no tumor palpable. Gall-bladder region normal. An apparent slight tenderness over the appendix. Stomach contents analyzed after test breakfast and an absence of hydrochloric acid observed. No evidence of pyloric obstruction, and no tumor could be felt in the abdomen. Gynecological examination was negative. A proctoscopic examination showed the rectum to be normal; the nose, mouth, and throat were normal. She had a small goiter.

The blood examination showed a red-cell count of 3,800,000; leucocyte count, 8,000; a hæmoglobin of 60 per cent; and she showed a marked secondary anæmia.

With these findings we were somewhat puzzled. While they were suggestive of a number of conditions, the symptoms did not meet the clinical requirements with sufficient accuracy to make a definite diagnosis of any of the ordinary abdominal lesions. We therefore advised her, inasmuch as we were unable to diagnose her case, that she be

given rest in bed for a month, that she be kept under observation by her family physician, and that, because of her anæmic condition, she should be given iron and arsenic hypodermatically, and her nutrition be pushed to the maximum.

In one month she returned with practically no change in her condition and we sent her to the hospital for further observation. Another week passed and we were unable to make a positive diagnosis. She returned home and consulted us again in December, 1913. At this time Dr. William Northrup was called in consultation and asked to make an analysis of the blood, urine, and fœcal excretions. He reported the same findings as were observed at the previous examination, except that he found a small quantity of blood in the patient's stool and in the stomach contents. These combined findings suggested to us liver disease, gastric ulcer, duodenal ulcer, or malignant disease of the stomach. Dr. Northrup made a probable diagnosis of papilloma of the stomach, and advised an exploratory laparotomy.

The patient was properly prepared by stomach lavage, thorough catharsis, and the administration of liquid nourishment for twenty-four hours before operation. Patient was given ether anæsthesia, and an incision was made slightly to the right of the median line, extending a short distance below the umbilicus. Nothing abnormal was found after a most careful search of the viscera, excepting a small apparently movable tumor, larger than a pigeon's egg, situated on the posterior wall inside of the stomach near the greater curvature about four inches from the pylorus. Finding no other cause for her trouble we incised the stomach and removed a papillomatous growth about the size of a pigeon's egg. The pedicle was small, about half an inch long and permitted of considerable movement of the tumor. It was a simple matter to remove it and cauterize the stump. The stomach was closed with three layers of sutures, and there was very little hæmorrhage. The patient made a satisfactory and uneventful recovery. She vomited a small amount of blood after operation, which was probably due to the manipulation necessary to a thorough examination of the stomach before and during the removal of the tumor.

So far as we are aware, this is the first case of papilloma of the stomach that has been operated upon, where an almost positive diagnosis of the case was made before operation. It is rather unusual for a papilloma situated in this part of the stomach to cause the symptoms from which this patient suffered. It is now nine months since the operation was performed and since that time she has never had any pain, or any other symptoms referable to the stomach.

We assume that the tumor in this case was benign because there were no evidences whatever of metastases and because thes tumors are usually of benign character, also because nine months have elapsed without any evidence of a recurrence of the tumor. However, a pathological examination of the specimen was made by Dr. Warthin, who reported that the growth was a papilloma on an adenocarcinomatous base. We will keep the patient under observation, and time will tell whether the tumor was benign or malignant in type.

The case has been a very instructive one to us, and has stimulated us to consider the possibility of the existence of benign tumors in obscure cases of gastro-intestinal disorders, associated with the presence of occult blood in the stools. It has also drawn our personal attention to the fact that in operating upon tumors of the stomach, one should bear in mind that while benign tumors of this organ are rare, they are not so rare but that they should be given grave consideration in deciding upon the surgical procedure that will conserve the best interests of the patient.

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CANCER OF THE BREAST[1]

By W. SAMPSON HANDLEY, M.S., F.R.C.S., London, England

IT may be asserted that the most important contributions on the subject of breast cancer have been written in the English language, either on this side of the Atlantic or on the other, and that had it not been for these contributions the surgery of breast cancer would still be in an unsatisfactory condition. Even at the present day it is my conviction, wrong though I may be, that the operative treatment of breast cancer is better carried out in the English-speaking countries than it is on the continent of Europe. Quite recently a distinguished French surgeon maintained that the removal of the pectoral muscles for breast cancer was a quite indefensible procedure which permanently crippled the unfortunate patient subjected to it. Could a more grotesque caricature of the truth be imagined? A patient with bilateral breast cancer on whom, for special reasons, I removed the pectorals on one side only, told me that she could not detect any difference in the usefulness of her two arms; both are practically as free as before the operation was performed.

I listened with great interest to the description by Professor Rodman of the method of operation which he has devised to minimize the hæmorrhage and, what is more important, to prevent any risk of the massage of cancer-cells along the lymphatic vessels — a point which is of great importance — and I shall certainly try Professor Rodman's method.

On points of pathology I find myself in such close agreement with Professor Rodman that I have nothing to criticize in his address. His operation completely fulfills the pathological requirements of the permeation theory, and it may prove to be the best of the variations of technique which are possible within the lines and limits laid down by pathology.

I feel, however, that as regards his brief clinical description of typical cases of carcinoma, I may be allowed to think that he laid too much stress on the fixity of the lump in the breast. It is, I think, more important to lay stress upon the fact, which he no doubt fully recognizes, that certain carcinomata of the breast are as mobile as an adenoma. I have, in fact, been accustomed to teach that a supposed fibro-adenoma of the breast, first developing after the age of forty, is more likely than not to be what I term a "mobile" carcinoma.

In regard to the value of frozen section methods, I agree with every word he says, provided that the section is made and examined by a pathologist expert in this particular procedure; but in this country at any rate such men are not available for every surgeon.

Regarding my own work on breast cancer it has been mainly pathological, though I myself am a practicing surgeon, and I venture to maintain that the surgery of breast cancer, like all other branches of surgery, can make sure advance only along the lines marked out by pathological research. The statistics of operation — and I would here take the opportunity of congratulating Professor Rodman on his brilliant results — are highly important as confirmatory evidence, but they can offer no sure guidance to the right lines of advance. They are entrenchments to ground which must previously have been won by pathology. Holding these views, I have made it my endeavor to rationalize the operation for breast cancer by a study of the phenomena of dissemination. The important work of Stiles and Heidenhain upon the dissemination of cancer within the limits of the breast did not produce, even in the minds of these authors themselves, any doubts as to the general validity of the theory of dissemination which held the field a few years ago; namely, the embolic theory or water-carriage theory, to borrow the phraseology of sanitary science. The cancer-cells set free from the primary growth were supposed to be so much driftwood swept along by the lymph- or blood-streams until arrested in their narrower channels. In reality, this view appears to hold good only for the emboli which reach the barrier of the axillary lymphatic glands. A

[1]Presented in the discussion of Professor Rodman's paper on Cancer of the Breast, read before the meeting of the Clinical Congress of Surgeons, London, July 31, 1914.

study of the secondary deposits which are easily accessible to observation, namely, those in the skin and bones, showed me that these secondary deposits, commencing near the primary growth, spread in a *centrifugal* manner from it.

TABLE SHOWING THE FREQUENCY OF CANCEROUS DEPOSIT, OR SPONTANEOUS FRACTURE, IN 329 CASES OF MAMMARY CANCER AT THE MIDDLESEX HOSPITAL, 1872 TO 1901.

	Bone	Number of Cases	Percentage of Total
Bones lying wholly or partially within the area liable to subcutaneous nodules.	Sternum	30	9
	Ribs	28	8
	Clavicle	5	1.5
	Spine	12	3.6
	Cranial bones	9	2.7
	Scapula[1]	1	.3
	Femur	14	4.2
	Os innominatum[2]	0	0
	Humerus	9	2.7
Bones lying beyond the area liable to subcutaneous nodules.	Radius	0	0
	Ulna	0	0
	Tibia	1	.3
	Fibula	0	0
	Patella	1	.3
	Bones of hand	1	.3
	Bones of foot	0	0

[1] This bone, owing to its shape, is not much liable to spontaneous fracture, and rarely comes under observation at an autopsy.

[2] Knee ankylosed, femur affected in its whole length, with extension of growth to patella and head of tibia.

Note that while in extreme cases this centrifugal spread may involve the greater part of the area of the body, the arms below the elbows and the legs below the knees are never the seats of such deposits. Yet it is in the distal extremities above all other places that we should expect to find evidence of embolism.

How could this extensive centrifugal spread be accounted for? I began to make microscopic sections of long centrifugal strips of the skin and subcutaneous tissues, radiating from the primary growth. In them, at points near the growth, isolated nodules of secondary growth could be seen. Farther out at a varying distance up to ten inches from the primary growth, I found a narrow and elusive zone a few millimeters wide where the lymphatic vessels were choked by cancer-cells. Beyond it the tissues were normal. This zone was met with in each of my radiating strips, and it constitutes the true growing edge of breast cancer. It may be found at any distance up to two feet from the primary growth. The detection of this microscopic growing edge is the foundation stone of the permeation theory of dissemination.

These facts can only be explained as follows: The immense proliferative pressure of the epithelium at the primary focus forces cancer-cells into the small lymphatics, along which they grow in continuous lines. This process which I have called permeation is the master-process of dissemination.

Reaching the lymphatic plexus into which the breast in the first instance drains, permeation involves a larger and larger circular area of this plexus, filling up its channels with lines of cancer-cells and sending offshoots into the adjoining muscular and cutaneous layers. Sooner or later cancer-cells are thus brought into the serous cavities and rapid visceral dissemination rings down the curtain.

You may ask, If permeation has so much importance, how could it so long escape observation? The answer is that it is a fugitive process, that the permeation of a lymphatic is followed by a curative process which obliterates the lymphatic and destroys the cancer-cells contained in it. The track of a forest fire is easy to follow, but permeation in its continuous, slow, centrifugal spread leaves behind it only an almost undetectable network of fibrosed lymphatics and an occasional isolated secondary nodule where the protective process has failed. Cancer, then, must be conceived of as a gigantic "ringworm" of permeated lymphatics situated in the plane of the deep fascia.

The main operative principles deduced from the permeation theory are: First, the area which demands widest removal is that in which the growing edge is situated, namely, the deep fascia, in which is found the lymphatic plexus which forms the highway for the spread of the disease. Second, the area of deep fascia removed must be roughly circular in outline, since permeation spreads with approximate equality in all directions from the primary growth. Third, the primary growth must always be the center of the area of fascia removed. Failure to observe this rule accounts for many recurrences. Fourth, the skin and muscles being secondarily involved over a smaller area, and less widely than the fascia, the removal of a smaller area of these tissues will suffice. The removal of the embolically invaded regional lymphatic glands is, of course, essential.

BILATERAL CONGENITAL CAPUT OBSTIPUM

By ARTHUR H. MORSE, M.D., San Francisco, California
Instructor in Obstetrics and Gynecology, The University of California
From the Woman's Clinic of the University Hospital

A NUMBER of theories have been advanced to explain cases of congenital wry neck, or caput obstipum. Generally, of course, the familiar deformity—inclination of the head to one side with rotation toward the opposite side—is due to shortening of one of the sternomastoid muscles, but as to what causes this shortening, there is a difference of opinion. Very frequently infants which present the deformity have been delivered by some operative procedure, notably by breech extraction (Gauss) and therefore are thought to have suffered a birth-injury. This, no doubt, is often true. According to Stromeyer, Witzel, and others, the most common cause of congenital wry neck is a partial or complete rupture of the sternomastoid muscle which has healed with subsequent contraction of the cicatrix.

Birth-injuries, however, do not explain all cases of congenital wry neck; and, in not a few instances, the antenatal existence of the abnormality must be assumed. This view, expressed in 1670 by H. Van Roonhuysen, has recently gained much sound support. For example, it has been shown that congenital wry neck may be associated with other fœtal deformities, as harelip, club-foot, and luxation of a joint; and this association indicates that wry neck may be due to an error in development. The occurrence of this deformity of the embryo in cases of tubal pregnancy also demonstrates that it may arise in consequence of faulty development. Thus, Joachimsthal has described the case of a four and one-half months extra-uterine pregnancy in which the fœtus presented typical right-sided wry neck as well as double club-foot, deformed fingers and toes, and a deformity of the head. Similar cases have been recorded by Czerny and others. Furthermore, the well-known occurrence of wry neck in mother and child indicates that the deformity may be inherited. Hereditary transmission has been observed by Dieffenbach, Pfeiffer, and Joachimsthal, and in none of these cases was there a possibility of injury at the time of birth.

Occasionally adhesions between the amnion and the face of the embryo bring about a position of the head which interferes with the development of one of the sternomastoid muscles. This hypothesis has been elaborated by Petersen, who holds that when one side of the face adheres to the amnion the body of the embryo falls in the opposite direction. Consequently the development of the sternomastoid muscle on the side where the adhesion exists is not interfered with, but the points of insertion of the opposite muscle are brought nearer together, and this influence tends to the production of wry neck. Petersen accepts the teaching of Ahlfeld that amniotic adhesions occur more frequently on the left side of the embryo, and predicts that in these cases the right sternomastoid will generally be the muscle affected.

Other mechanical factors which tend to disturb the normal relation of the head and body of the fœtus have been suggested as a cause of caput obstipum, but most of these suggestions have been offered to explain isolated cases and are not of wide application. Thus, Busch found tilting of the pelvis a satisfactory explanation, and Meinhard Schmidt regarded the pressure of the mother's liver upon the pregnant uterus as sufficient to explain the wry neck of an infant which presented by the breech. From his experience Schmidt concluded that conditions which favor the deformity include breech presentation, pelvic contraction, primiparity, and a small amount of amniotic fluid.

Several authors who accept the view that caput obstipum frequently develops *in utero* and is due to an unnatural compression of the fœtus, prefer to explain the change in the sternomastoid muscle not by a cramped position, but by some interference with its blood-supply. Völcker in particular has ad-

vocated the ischæmic hypothesis and has demonstrated degenerative changes in the muscle, which he considers may be explained in no other way. Koester also accepts this explanation for his case, in which the diseased muscle was 2.5 cm. shorter than the healthy one, and was replaced almost entirely by fibrous tissue. Similar explanations have been given by Schloesmann, Zimmermann, Couveliare, Durante, Fridberg, and Rettig.

On the other hand, Volkmann has found changes in the muscle which, in his opinion, may be interpreted only as the result of an inflammatory process. Mikulicz also has described a case which he thought due to a true inflammation, designated fibrous myositis; it was accompanied by hyperplasia of the lymph glands. Subsequently from the same clinic Kader published cases ascribed to hæmatogenous infection. While the accuracy of these observations can scarcely be questioned, they are probably exceptional. In such instances the possibility of an umbilical cord infection and of an injured sternomastoid muscle, representing a *locus minoris resistentiæ*, must not be overlooked. Otherwise, it is difficult to understand why one, and not both, of the sternomastoid muscles was affected. Indeed, most of the hypotheses offered to explain congenital wry neck are applicable only to cases where deformity is limited to one side. And while unilateral cases greatly predominate, double congenital wry neck is a possible though very rare deformity. An instance of the latter kind has recently been observed in the Woman's Clinic of the University Hospital, and inasmuch as the mother was delivered at the onset of labor by cæsarean section there can be no doubt that the deformity of the infant existed during intra-uterine development and was independent of birth-injury.

P. J., Russian Jewess, 1-para, 21 years old, pregnancy normal. *Pelvic measurements:* Spines 22 cm., crests 26 cm., trochanters 28.5 cm., external conjugate 17.5 cm., diagonal conjugate 11.5, bituberal 7 cm., anterior sagittal 4.5 cm., posterior sagittal 9 cm. *Diagnosis:* Generally contracted, funnel pelvis. *Labor* began September 10, 1913, at 5 P. M. The poorly flexed head was floating in the left occiput posterior position. Fœtal heart sounds were distinct in right lower quadrant, 140 to minute. The round ligaments were parallel, indicating a posterior attachment of the placenta. Uterine contractions were infrequent and not severe until 8 P. M., when a vaginal examination revealed the following: Cervix dilated 3 cm., canal obliterated. Brow presenting with large fontanelle to the right and anterior. An elbow had prolapsed posterior to the head. At this examination the membranes were ruptured accidentally. A very small amount of amniotic fluid escaped, not more than 100 ccm.

Several methods of delivery were considered. On account of the danger of prolapse of the cord, manual dilatation of the cervix followed by version and extraction did not seem to offer a favorable outlook for the child. And, if manual dilatation of the cervix were performed, the almost certain occurrence of deep cervical lacerations would have made pubiotomy inadvisable in the event of serious pelvic resistance. Consequently cæsarean section was selected and the classical operation was performed. The uterine cavity did not contain any amniotic fluid. Convalescence was uneventful. The child, a male, weighed 3,180 gm. and was 49 cm. long. The measurements of the head were: O. M. 13, O. F. 12, S. O. B. 8.5, Bi. P. 10.25, Bi. F. 7.5, S. O. B. Circ. 32 cm., Shoulders Circ. 32.5 cm. The child was slightly asphyxiated but was quickly resuscitated by the use of hot and cold tubs. It held its head persistently in marked extension, so that the occiput was almost in contact with the interscapular region. Evidently the notable extension of the head existed before birth and probably explained the prolapse of the arm.

During the four weeks the child remained in the hospital it continually held its head in marked extension. It could not nurse satisfactorily unless the head was thrown back; it breathed more easily in this position, and whenever the head was forced into flexion the infant seemed very uncomfortable. Removal of the force was promptly followed by a return to the unnatural extended attitude.

After discharge from the hospital the mother left the city and did not return for nine months. Upon request she then brought the infant for observation. Development, it was found, had proceeded normally and the head was now held in a perfectly natural position. The mother stated that the infant had continued to hold its head back until it was four months old, when the natural attitude was assumed. She attributed the cure to the systematic massage of the neck she had performed.

At first we ascribed the extremely retracted position in which the infant originally held its head to the fact that it had been a brow presentation; but as there was no tendency to assume a normal attitude we searched for some other tangible cause. However, there was no tumor of the neck and radiographs showed that the thymus was of normal size. An X-ray photograph of the spinal

column taken a few days after the infant was born represented the spinous processes of the second and third cervical vertebræ so closely approximated that a fusion between these structures was suspected. But a later radiograph showed a normal vertebral column. Furthermore, there was no clinical evidence to indicate that the infant was suffering from an infection. Its temperature did not rise above normal, and there was no nutritional disturbance.

Although several hypothetical explanations for the persistent extension of the head suggested themselves, all could be ruled out except one, which assumed that there was shortening of both sternomastoid muscles. These structures could be more distinctly palpated than in normal infants of about the same age. Therefore the question arose as to whether spasmodic contraction of both sternomastoid muscles would produce such a deformity as was present in this case. And as conflicting evidence was offered by several anatomical authorities which were consulted, this question was submitted to experiment.

A recently delivered stillborn, but not macerated, infant was dissected. Both sternomastoid muscles were exposed and carefully separated from the contiguous tissue. An assistant then held the cadaver in a horizontal position, supporting the head in the normal attitude and so as not to prevent movement either forward or backward. Now by means of an artery clamp each of the exposed sternomastoid muscles was seized about its middle point and traction made upon the mastoid processes. Slight backward rotation of the head occurred; repetition of the experiment was always followed by the same result.

The following supplemental experiments also were made. Heavy silk sutures were fastened upon each mastoid process at the point of insertion of the sternomastoid muscle; they were brought downward approximately in the course of these muscles and were passed beneath the sternoclavicular joint. The lower ends of the sutures were left free. Again the cadaver was placed in the horizontal position just described, the lower free ends of the sutures were seized, and traction made upon the mastoid processes. As in the the previous experiment, the head swung backward and even to a more notable degree, for strong traction upon the sutures brought the occipital region of the head directly against the interscapular region. This position was the same that had been noted clinically, and thus the experiments demonstrated that the extreme extension observed in our case could be explained by the action of the sternomastoid muscles. Furthermore, as other possible causative factors had been excluded, this clearly was the correct explanation.

A similar deformity has been described by Hildebrand, and, so far as we have been able to ascertain, that is the only other case of bilateral caput obstipum which has been recorded. The infant was delivered by the breech, and as the birth was spontaneous Hildebrand considered that the possibility of injury could be excluded. However, the delivery of the head was delayed and the infant was slightly asphyxiated. At first no deformity was present, but when four weeks old the infant began to hold its head backward. Small, hard tumors were then felt about the middle of both sternomastoid muscles. They were not adherent to the skin. The infant was operated upon and at the operation the tumors were found buried in the muscle. A few weeks later the child died of inanition and bronchopneumonia.

Sections showed a marked decrease in the muscle fibers in the region of the tumors, though many fibers still remained, and there was no doubt that functional activity had persisted. No blood-pigment could be demonstrated and, therefore, the tumors were judged not to be organizing hæmatomata. The pathological diagnosis was "interstitial myositis." With regard to the cause of the lesion the author concluded that it could not be explained by any process with which we are at present familiar.

The position in which the head was held in Hildebrand's case, which was identical with that noted in our own, he attributed to the spasmodic contraction of the sternomastoid muscles. "These muscles," he said, "arise from the mastoid processes and from the cervical line behind the latter, and,

because their principal origin lies somewhat behind the joint (the occipito-atlantoid), the extreme extension is clearly explained. Naturally it will be most marked when the posterior portion of the muscles is that chiefly involved in the contraction."

The primary factor in the shortening of the sternomastoid muscles in our case could not be definitely ascertained. However, it is certain that amniotic adhesions were not involved in the process, and, as the deformity disappeared in a few months, it is equally certain that no permanent defect in the development of the muscles existed. An inflammatory affection also may be ruled out. The most reasonable explanation for the shortening of the muscles, it would seem, was the partially extended position the fœtal head occupied *in utero*. This in turn was referable to the pelvic contraction of the mother and the restriction of fœtal movement in consequence of a relatively small amount of amniotic fluid.

Long-continued extension of the fœtal head and, as a result, the approximation of the points of insertion of the sternomastoids, must interfere temporarily with the growth of these muscles, or at least with their functional activity. The experiments which Heller has made upon dogs prove that muscles ultimately shorten whenever their points of insertion are permanently brought near together. Similar conditions are imposed upon the sternomastoids by extension of the head, and the effect of this position must be commensurate with the duration of the enforced attitude. In our case the subsequent history demonstrated that the position had not been maintained long enough to produce irreparable muscular degeneration. Nevertheless, the changes were sufficiently severe to delay the correction of the deformity until somewhat later in infancy than usual. In the case of infants delivered in face presentation, for example, the retracted attitude of the head usually disappears in a few days.

The relatively long persistence, yet spontaneous correction of the deformity, its independence of birth-injury, and, therefore, the support given the view that wry neck is not always of traumatic origin, and the demonstration of the action of the sternomastoid muscles in extending the head are facts worthy of clinical emphasis.

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A SERIES OF FILIFORM APPENDICES[1]

By H. K. BONN, M.D., Indianapolis, Indiana

By a filiform appendix is meant one having a diameter of two millimeters or less while the length may be that of the ordinary appendix. Filiform appendices are slender white cords usually covered in part or all of their extent by the fold of Treves, or that of Jonnesco and Juvara, or what is commonly called a pericolonic membrane.

In the past year I have collected seven specimens of filiform appendices. Five of these appendices were completely covered by the fold, and therefore necessitated shelling out from beneath the membrane before their delivery could be accomplished. One appendix was covered for its proximal three-quarters of an inch, the remainder being free. Another specimen showed the tip of the appendix bound down by the membrane while the remainder was practically free.

The filiform appendix was so named and described by Joseph Rilus Eastman.[2] Eastman states that the proximal inch of the appendix may be of normal size, but that the portion which is constricted by the overlying membrane may have a cross diameter of only two or three millimeters. He describes another type of filiform appendix; namely, that variety in which the vermiform appendix is drawn out into a fine strand, the adherent tip drawing a small membrane from the mural peritoneum. By the courtesy of Doctor Eastman, I am enabled to show you his original illustrations of these two types of filiform appendices of which I have spoken (Figs. 1 and 2).

I desire to direct attention to the fact that a filiform appendix is apt to be mistaken for an adhesion, and that one may even be led to believe, because of the difficulty so frequently experienced in their discovery, that the appendix is either congenitally absent or that the organ has been obliterated by some pathologic process.

The principal types of these filiform appendices which I have been able to find are as follows: First, the appendix in which the proximal inch is of normal size and free, while the remaining part is enveloped by a pericolonic membrane. Second, the appendix in which the tip has been caught on the mural peritoneum, resulting in the drawing out of the organ into a slender strand. These two types I have already described. Third, the appendix in which the proximal three-quarters of an inch is definitely constricted by the pericolonic membrane, while the remainder is free (Fig. 3). It is only recently that we have found this type. There may also be another type in which, due perhaps to some failure in cæcal torsion, the appendix may be caught in retro-cæcal position and again become stretched out into a small cord. Fourth, the appendix which is completely covered by the pericolonic membrane. Fifth, the appendix in which the tip is covered by a membrane.

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The striking feature associated with filiform appendices is that they are quite constantly accompanied by, or associated with, pericolonic membranes or folds. In other words, this type of appendix is almost always found beneath a membrane and, therefore, one naturally assumes that a causative agent in the production of filiform appendices must be constriction by a pericolonic membrane to quite some extent.

The exception to this etiology of a filiform appendix is the type already described, in which the appendix has been caught on the mural peritoneum, and possibly the type which is found in a retrocæcal position in only partially descended cæci. This last type may perhaps be merely an affair of adhesions.

The condition of the terminal ileum, cæcum, and ascending colon in cases where filiform appendices are found is a matter of considerable interest. Except in those cases of partially descended cæci with a retrocæcal appendix and in the instances where the tip of the appendix has been caught on the

[2] Experimental and Clinical Studies of Colon Stasis. J. Am. M. Ass., 1914, Aug. 8.

[1] Read before the Surgical Section of the Indiana State Medical Association, September 25, 1914.

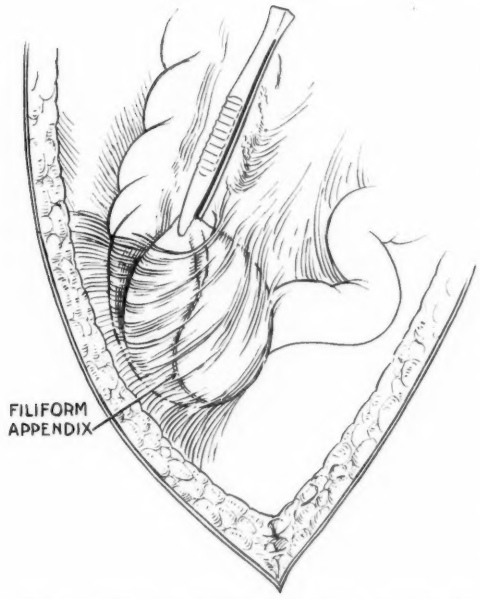


Fig. 1. Filiform appendix buried under Treves' fold. (J. R. Eastman.)

peritoneum and then drawn out into a slender cord, the cæcum and ascending colon, more particularly the cæcum, have been covered by a strong pericolonic membrane. Therefore, in our experience, with but few exceptions filiform appendices are found with great uniformity beneath pericolonic membranes.

The folds of Treves, of Jonnesco and Juvara, and kindred folds have been thoroughly studied by Joseph Rilus Eastman, J. M. Flint, David Cheever and D. G. Reid. I have confined my attention to these folds only as they are related to the formation of filiform appendices. In Reid's[1] latest contribution to the subject on these folds, he speaks of finding, during the dissection of an adult cadaver, a short appendix 3.5 cm. long which was found buried under a strong membrane. Nothing is said concerning the cross diameter of this appendix.

The first four or five filiform appendices that I observed were shelled out from beneath the overlying membrane. These appendices were the complete type; that is, the appendix was represented by a slender white cord, having the length of the normal appendix but the cross diameter being only one or two millimeters. One filiform appendix which I observed was constricted by a fold of Treves for the first proximal inch of the organ but the remainder was entirely free from any encompassing membrane.

Another patient showed the following conditions: A fold of Jonnesco and Juvara enveloped the lower five inches of the ascending colon, and in addition a fold of Treves covered the cæcum down to the beginning of the appendix. This appendix was also bound down by another peritoneal sheet which covered the distal one-half inch, the tip being held in an abnormal position by several small peritoneal reflections from the pelvic peritoneum which stretched the organ, or rather dragged upon it, each time that a peristaltic wave occurred.

GROSS PATHOLOGY

The gross appearance of the typical filiform appendix is that of a slender white cord having a cross diameter of two millimeters or less, the length varying from three to seven centimeters. In one instance a filiform appendix measured immediately after removal gave a cross diameter of only one millimeter and several have measured between one and two millimeters.

Some filiform appendices when allowed to slip through the fingers give the same sensation as the feel of the vas deferens during its identification in an operation for varicocele or hernia.

In all of the specimens of complete filiform appendix which I have examined, I have been unable to find a lumen, using the unaided eye. In a case of partial filiform appendix, I could demonstrate a lumen in both the constricted and free portions, the lumen in the constricted portion being decidedly encompassed. The constricted portion appeared to be markedly blanched as compared with the free extremity. There were no visible blood-vessels in the constricted proximal portion, while these were present to the usual degree in the distal end.

[1] D. G. Reid. The Genesis of Jackson's Membrane; Notes on the Genito-Mesenteric Fold of Peritoneum and the Supra-Adhesion Foramen. J. Anat. & Physiol., 1914, July.

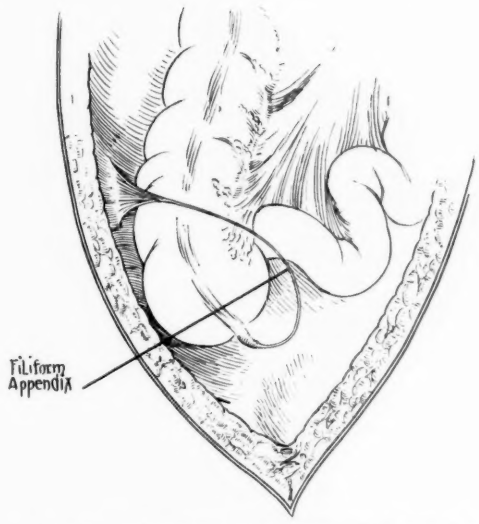


Fig. 2. Vermiform appendix drawn out into a fine strand, adherent tip drawing out a small membrane from mural peritoneum. (J. R. Eastman.)

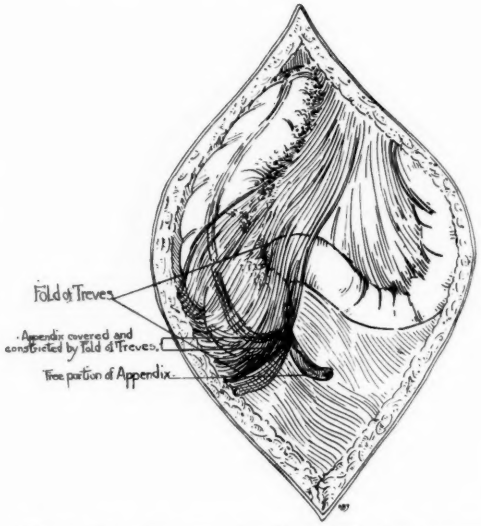


Fig. 3. Note the narrowing of appendix due to constriction by fold of Treves. Drawn from specimen.

MICROSCOPIC PATHOLOGY

I wish to acknowledge my indebtedness to Mr. E. N. Kime of the Indiana University School of Medicine for having made my sections, some twenty-five in number. These appendices were cut at various levels; some were cut in cross sections and others in a longitudinal manner. The one case of partial filiform appendix was cross-sectioned at two different levels of the constricted portion and likewise the free extremity.

MacCarty and McGrath[1] found that twenty-two out of five thousand appendices examined microscopically were carcinomatous. They state that the lesion itself consisted of islands of masses of epithelial cells, which were scattered throughout the submucosa, muscularis, and subserosa. The nuclei presented the irregularities which are characteristic of carcinomatous cells. In these cases of early carcinoma, the growth was in or near the tip of the organ and the lumen had been obliterated. The authors state that, in their series, carcinoma had occurred always in appendices in which the lumen had been partially or totally obliterated. MacCarty and McGrath do not state whether a pericolonic membrane was found associated with any of these cases of carcinomatous appendices with deficient lumina.

It is certainly more than a coincidence that carcinoma should only be found in the appendices with partially or completely obliterated lumina and therefore the obliteration of an appendicial lumen by a constricting pericolonic membrane can logically be considered as a possible causation of appendicial carcinoma. In none of the specimens which we examined, despite a thorough search, have I been able to find any field of carcinoma, nor has Dr. H. R. Alburger.

The following are the findings in several cross sections and one longitudinal section of filiform appendices.

Specimen No. 1. Cross section. This appendix shows a beginning round-cell infiltration in all parts, except the glands. The gland epithelium appears as if it were being pressed together and under the low power (Leitz ⅓), I am able to see that some cells, analogous to those lining the basement membrane of the glands, have been forced into the lumen. In one gland, the lower end is densely infiltrated by small round cells, and this infiltrate is also present in the submucosa and muscularis. There are many polymorphonuclear leucocytes present in the interglandular stroma.

[1] Ann. Surg., Phila., 1914, May.

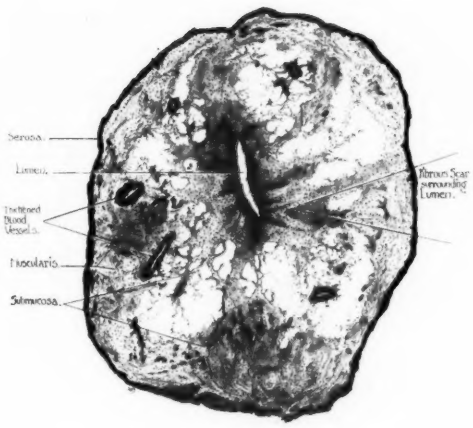


Fig. 4. Cross section of a filiform appendix.

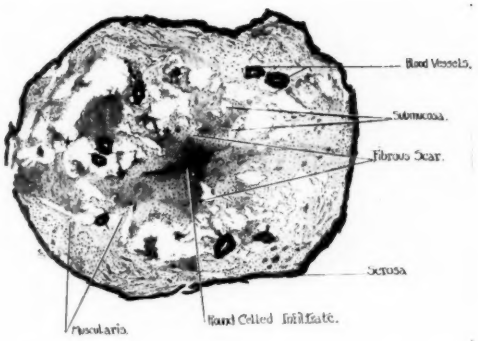


Fig. 5. Cross section of a filiform appendix. Note absence of lumen.

Specimen No. 2. Cross section. This specimen shows a decided thickening of the blood-vessels and the mucous membrane. The glands appear to be somewhat obliterated and are shut off from the lumen of the appendix by young connective tissue. In this specimen, the small round cells are increased and there is also a considerable number of leucocytes. Here, also, the small round cells are observed to be very dense at the distal end of the glands, and in some instances a few of the basement-membrane cells of the glands have been forced towards the center.

Specimen No. 3. Cross section. Here some scar-formation is present but the lumen persists. The glands are partially obliterated and appear as if they had been constricted for some time. There is an increase of small round cells and some leucocytes. The blood-vessels show evidence of hypertrophy and the mucosa and submucosa are beginning to be infiltrated with connective tissue. The nuclei of the mucosa stain deeply while those of the submucosa and muscularis stain only faintly.

Specimen No. 4. Cross section. This section shows a degeneration (hyaline?) of the submucosa and muscularis. The muscularis in particular appears disorganized, having only a few faintly staining nuclei. A lumen is still present and the round cells are increased. There are no glands to be seen. Two blood-vessels, with thickened walls and an almost obliterated lumen are present. The serosa appears thickened.

Specimen No. 5. Cross section. This appendix shows a distinct scar-formation but continues to have a very small lumen. The constriction seems to have been only of moderate severity. Blood-vessel hypertrophy is present to moderate degree and the peritoneum is uniformly thickened. A small amount of fibrous tissue is present, the muscularis and submucosa having been replaced by this tissue to some extent. No glands are to be seen, but round cells are present (Fig. 4).

Specimen No. 6. Cross section. There is a lumen present, but it is divided into two parts by the edges of the scar fusing together at the center of the lumen. No glands are to be seen, but small round cells are abundant. The serosa is thickened and likewise the blood-vessels, which continue to have a small lumen. The fusing together of the edges of the lumen of this appendix appears to be of a fairly solid nature and seems to be of a fibrous type.

Specimen No. 7. Cross section. In this section there is evidence of long-continued constriction since the center is represented by a star-shaped scar, there being no lumen. The peritoneum and blood-vessels are thickened to a moderate extent and there is a seeming disorganization of the muscularis. There are no glands present. There is a moderate amount of small round cells present.

That portion of the appendix which, in the ordinary specimen, represents the lumen, is occupied in this section by a star-shaped scar which appears to be a white homogeneous tissue of a fibrous nature (Fig. 5).

Specimen No. 8. Longitudinal section. This slide shows hypertrophied blood-vessels and a round-cell infiltration of all the tissues. Glands are present and there is a round-cell infiltrate of the stroma between the glands.

Specimen No. 9. These two sections were cut from the appendix which had the membranous constriction of the proximal end for three-quarters of an inch. The sections were made at both the non-constricted and constricted portions.

The non-constricted tip of this appendix had a normal lumen in contradistinction to the slightly decreased proximal portion where the constriction had occurred. The tip showed a considerable amount of round-cell infiltration, and leucocytes were present in a moderate amount.

The microscopical examination of the constricted portion showed as follows: All layers are infiltrated by round cells, this being particularly marked be-

tween the glands and in the submucosa and muscularis. There is considerable fragmentation of the mucosa, this being noticed in two specimens which had been cut at different levels. The glands are seemingly squeezed together and are apparently constricted, a moderate number of leucocytes are present.

Dr. H. R. Alburger, pathologist to the Indianapolis City Hospital, has kindly examined a few of my specimens and has suggested that the pathologic changes which have occurred in these filiform appendices have occurred in about the following order: "The increase of the connective tissue has replaced the muscular coats and as this connective tissue contracts it causes a replacement of the muscularis by itself. This connective tissue next constricts the lumen so that what was formerly the lymphoid tissue of the submucosa occupies what was formerly the lumen, the mucous membrane having disappeared by atrophy."

There are probably two processes associated in the production of filiform appendix; namely, a chronic inflammation and an involution due to the constriction by the accompanying pericolonic membrane.

Howard A. Kelly in his work on appendicitis gives a microscopical picture of an atrophied appendix with an obliterated lumen. The center of this specimen consists of fibrous tissue containing a moderate amount of fat; the circular muscular coat is atrophic and the walls of the blood-vessels are somewhat sclerotic. Kelly remarks that an obliterated appendix may be reduced to a thin fibrous cord or to a flattened band. Ribbert, Wölfler, and Zuckerkandl believed that obliterative changes in the appendix are not the result of an inflammatory process, but an involution process in a functionless organ, while Bierhoff, Fitz and Senn maintain that obliterative changes have a pathologic process.

DEPARTMENT OF TECHNIQUE

A MODIFIED INCISION FOR APPROACHING THE GALL-BLADDER[1]

By L. L. McARTHUR, M.D., Chicago

IT will be generally conceded that, when requiring extra room, the majority of surgeons make the perpendicular right rectus incision, modified after the suggestion of Bevan. That this gives the best access for any surgery required by the bile tracts cannot be denied. When it comes to closure of the incision, however, it will likewise be conceded that, on many occasions, the surgeon has learned that the difficulties of suturing the posterior sheath are often most trying, and sometimes it is impossible. The transversalis, whose fibers and tendon constitute the posterior sheath in this position, is an active respiratory muscle, and with each respiration so tugs and pulls on the line of sutures as to make it give way. To obviate this, it is the practice in the Mayo clinic to include the fibers of the rectus in every alternate stitch. The usual sutures, being inserted *between* the bundles of fibers of the tendon, meet with only the light intertendinous connective tissue and hence find little resistance to cutting out.

The very great comfort and benefit both to the patient and to the operator which comes from making the modification I am about to propose has but to be experienced once or twice to be thereafter utilized *in appropriate cases*. Let me emphasize here that the proposal is one for frank gall-bladder surgery only, and not for general surgery of the upper abdomen. In those cases, then, in which a perfectly obvious gall-bladder drainage, stone removal, or ectomy is indicated, let me urge the Fellows to incise the posterior sheath parallel with the tendinous fibers of the transversalis; i.e., nearly transversely. To select the level for its incision about an inch above

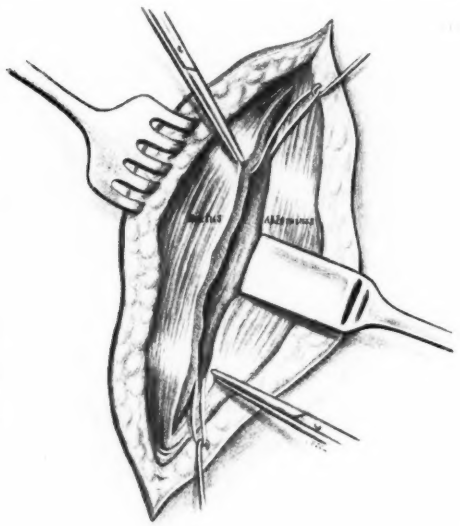


Fig. 1. Illustrating schematically the first step in the right rectus incision with the innervation to same crowded by blunt dissection to either end of the wound.

Fig. 2. Illustrating the transverse incision of the posterior sheath of the rectus (transversalis muscle and peritoneum) for access to the palpable and distended gall-bladder. It conserves the entire insertion of the transversalis muscle and its respiratory function. With the dropping back of the gall-bladder its separated margins fall back into position and can be easily sutured.

[1] Read before the Chicago Surgical Society, November 6, 1914. (See discussion, p. 102.)

the free end of the gall-bladder, making a small opening first for confirmation of the diagnosis, by digital exploration. The incision can then be enlarged to the middle line and as far laterally as seems essential. Here we meet our first surprise, for the transversalis (posterior sheath) can, with the gloved fingers, be separated from the internal oblique with ease. Secondly, when the necessary interference with the gall-bladder has been made and the latter dropped back, the cut margins of the transversalis are seen to lie in contact and its respiratory action noted as continuing normally. Then with the greatest ease the cut edges can be whipped together with catgut sutures under absolutely no tension. The support thus given by the uncut transversalis renders tension stitches wholly unnecessary and makes easy the closure of the anterior sheath and skin.

A refinement in the separation of the muscle fibers of the rectus muscle, after the cutting of its sheath, can be made by blunt cleavage from the midpoint of the incision with the handle of the scalpel in such a manner that the upper innervation is carried without rupture upward, and the lower in like manner downward, thus preserving intact the innervation of the mesial half of the rectus. The feasibility of this I have repeatedly demonstrated to my house officers and students and it is diagramatically shown in Figs. 1 and 2, which are self-explanatory.

I should apologize for taking even these few moments of your valuable time did I not know the pleasure you will experience in its use, particularly in the frankly palpable distended gall-bladder, as well as in the lessened suffering of the patient with every respiration because of the partial preservation of the abdominal breathing. Hernia cannot occur. The incision can at any moment be converted into the conventional one, should circumstances demand it.

PITUITARY EXTRACT IN MARGINAL PLACENTA PRÆVIA

A Case Report

By JOHN GARDINER, M.D., Toledo, Ohio

MRS. G., II-para. Pregnancy normal, except for a right marginal placenta prævia. The previous labors had been rapid, so precautions were accordingly taken. It was the two hundred and eighty-fifth day of pregnancy, and while sitting in bed eating dinner, there was a sudden gush of blood, flooding the bed. This was the first symptom in the onset of labor. About ten minutes later I saw her, and she was faint and blanched, the pulse hardly perceptible at the wrist. After placing her in the Trendelenburg position, examination revealed blood still oozing from the vulva. The cervix was dilated four fingers. It was fairly relaxed, and without much increase of hæmorrhage admitted of further distention. The perineum was also quite relaxed. One ccm. of pituitary extract solution and one-sixth grain of morphia were given hypodermatically. Five minutes after the injection of pituitary extract, as preparations were being made to pack the cervix and vagina, the contractions of the uterus were increased. The contractions could be felt first on the left side of the abdomen passing over the fundus, wavelike in character and rapidly following one another. After a few seconds, the uterus was seen to move to the right side of the abdomen, and the same characteristic contractions could still be felt over the fundus.

The head descended, causing a cessation of the hæmorrhage. Eight minutes later the birth occurred. The cord was wrapped, twice, tightly about the neck. The child, born in the state of asphyxia, pulse rate forty-two per minute, was resuscitated. The placenta was expelled unassisted, ten minutes after the birth. There was no laceration of the cervix, and the uterus was contracted to the size of a goose-egg. The placenta was torn across through the maternal portion two inches from the border. The separated segment was covered with a blood-clot.

This case of placenta prævia is reported because it permitted the control of the hæmorrhage by the pressure of the advancing head. This course was determined upon because of the degree of dilatation and relaxation of the cervix. It is, however, an accepted obstetrical rule that great care be employed in the dilatation of the cervix in placenta prævia.

SURGERY OF THE CLEFT PALATE [1]

By JAMES BERRY, B.S., F.R.C.S., London, England

THE operation by median suture (a modification of Langenbeck's) is the only one which restores the palate to its natural condition. If properly performed, this operation gives the patient the best prospect of subsequent good speech. The age at which it is best to operate is the earliest at which the cleft can be satisfactorily closed by median suture; the exact age depending largely upon the nature of the cleft. Narrow clefts, especially if limited to the soft palate, can be operated on with advantage by this method within the first few months of life. The common single or double complete cleft, associated with harelip, should be treated by closure of the harelip in earliest infancy, the operation on the palate being postponed until the second or sometimes the third year. I have never advocated postponement of operation to any later period than this. At and soon after birth the cleft is usually very wide and the palatine arch low.

If any median operation were attempted at this very early period, it would usually fail unless preceded by the wiring operation of Brophy, which I believe is too dangerous to be generally employed. The reason for postponing the palate operation for a year or two is that after suture of the harelip the cleft in the palate undergoes rapid spontaneous narrowing, and the development of the alveoli makes the arch higher. In proof of this I would call your attention to photographs of three similar cases of complete single cleft palate (Figs. 1, 2, 3). Figure 1 shows the usual very wide cleft as seen soon after birth. Figure 2 is an exactly similar case, in which after suture of the harelip and then a delay of two years the cleft had become so much narrower that it was easily closed by median suture with excellent result. The third case of the same kind shows a still greater degree of spontaneous closure. The patient was not seen by the speaker until she was ten years old, having been left unnecessarily long without operation.

I agree entirely with Sir Arbuthnot Lane as to the "simplicity" of his turnover-flap operation and also with the statement that most mothers of cleft-palate babies (and often their doctors) are

Fig. 1.

Fig. 2.

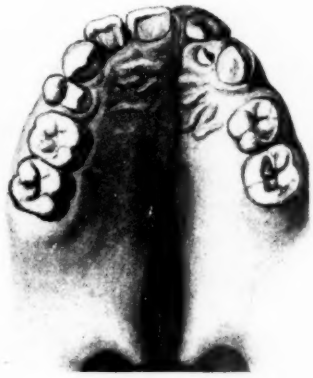


Fig. 3.

Three similar cases, at different ages, of one of the commonest forms of cleft palate; namely, the single complete cleft, associated with harelip.

Fig. 1. Patient died from another cause soon after birth without operation of any kind. If the cleft be closed at this early age in such a case, it can be only a turnover-flap operation or the wiring operation of Brophy, subsequently followed by median suture.

Fig. 2. An exactly similar case. The harelip was closed soon after birth and the palate operation postponed for two years, by which time the cleft had assumed the appearance shown in the photograph. The palate was then closed without difficulty by Mr. Berry's slight modification of Langenbeck's original operation of median suture, and with good result.

Fig. 3. Similar case, in which the harelip had been closed in early infancy (by another surgeon), but the palate operation had been postponed much too long; namely, until the age of ten years. It will be seen that the process of spontaneous closure has progressed still further. Closure by Langenbeck's operation was easily effected with a good result.

[1] Presented in the Symposium on Cleft-Palate Surgery at the meeting of the Clinical Congress of Surgeons of North America, London, July 30, 1914.

Fig. 4.

Fig. 4. Median cleft of the soft and part of the hard palate without harelip, the type of case that is often most difficult to close by operation. From a drawing made, as were most of the others also, from a cast and from the living subject. The cast enables the artist to reproduce the exact size with greater accuracy. (Case No. 103.)

Fig. 5.

Fig. 5. The same child some little time after complete closure of the cleft by an ordinary median (or Langenbeck) operation at the age of one year and ten months.

exceedingly anxious that operation be performed as early as possible. This is but natural and accounts largely for the frequency with which such operations are performed at the present day, especially by those who do not follow up their cases and ascertain the actual results as regards subsequent speech. Sir Arbuthnot Lane, so far as I know, has never brought forward any *proof* that the ultimate result of the turnover operations are really good. Many present may perhaps remember how, at the great demonstration of post-operative cleft-palate cases arranged by the Royal Society of Medicine a few years ago, with the object of comparing the results of the various operations, Sir Arbuthnot Lane exhibited but one patient, and that a child too young to speak at all! Mr. A. W. Murray, myself, and others, on the same occasion, showed a large number of patients successfully operated upon by the Langenbeck operation or by some modification of it.

Fig. 6. Cleft of soft and most of hard palate before operation. Width 25 mm. One of the patients exhibited at the meeting. Cleft completely closed; patient now aged 26 and speaks well.

I believe that exact information as to the subsequent results of operations should be brought forward by the advocates of the turnover-flap operation in early infancy. Why do they not publish long series of consecutive cases, giving actual after results, as the speaker himself has done more than once with regard to his own operations? With regard to lateral incision, I have employed it much less than formerly, as I find that the wide mattress stitch in the soft palate, similar to that employed by Brophy for this part, often renders it unnecessary. If employed at all, it should be quite short.

The most difficult cleft to close satisfactorily among my cases was one in which the lip and alveolus were unaffected but in which a very wide cleft involved all the rest of the palate and had a rounded anterior end (Figs. 4 and 6). In such

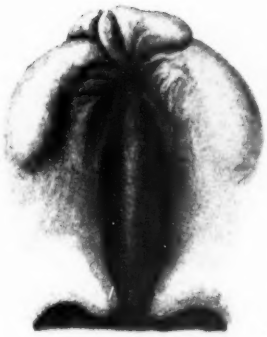


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 7. Double harelip and cleft palate, showing spontaneous closure of anterior part of latter after operation upon lip.

Fig. 8. To show how the nasal mucous membrane may be utilized in the closure of a unilateral cleft palate. The incision on the left side has been carried up into the nose along the side of the septum. (Case No. 130.)

Fig. 9. A similar case after operation. The nasal mucous membrane being of a deep red color appears in the photograph as a dark triangular area immediately behind the hole in the front of the palate, which in this case has not yet been closed.

cases it is thought best as a rule to close the soft palate at some period during the earlier part of the second year and, if necessary, to postpone the operation upon the hard palate for some months, when the opening would be found much narrower and capable of closure without difficulty. Often these clefts can be closed throughout at a single operation, while in a very few exceedingly wide clefts treatment by obturator is preferable.

In concluding I wish to present three patients on whom operations have been performed for the three principal varieties of cleft described. These patients demonstrate the satisfactory nature of speech following operation. In each case the whole palate was completely restored to its natural shape and the soft palate was freely movable without contraction or shortening. In one of these cases, operated on some years previously, the restoration to the normal appearance of the palate was so perfect that a member of the audience asked whether it was really true that the palate had ever been cleft! Fortunately, the mother of the child was present and able to assure him that such had been the case. The width of the cleft in this case at the time of operation was 11 mm. In another (Fig. 6) it was 25 mm.

THE PRINCIPLES WHICH GOVERN THE ULTIMATE RESULTS OF HARELIP AND CLEFT-PALATE OPERATIONS[1]

By GEORGE V. I. BROWN, M.D., F.A.C.S., Milwaukee, Wisconsin
Oral Surgeon, St. Mary's Hospital and Children's Free Hospital

THE vital issue in the controversy with regard to the surgical treatment of harelip and cleft palate that has been waged so earnestly on both sides of the water during recent years, when reduced to first principles and stripped of all confusing differences of surgical operative technique, which are, after all, of secondary importance, resolves itself into proper discrimination between the following surgical operative methods: (1) Compression (forcing the sides of the bony palate in early infancy); (2) flap-reversing operations (Lane, Davies-Colley); (3) flaps of bone and mucoperiosteum (Ferguson); and (4) mucoperiosteal flap-sliding operations as in the von Langenbeck-Warren types.

Final results. The standard of value by which the decision in making selection is to be determined must be the final result. Therefore, it is

[1] Read before the Clinical Congress of Surgeons of North America, London, July 30, 1914.

Fig. 1.

Fig. 2.

Fig. 1. Infant with double harelip and cleft palate, typical projection of the premaxilla, arrested development of the columns of the nose and philtrum of the lip.

Fig. 2. Same baby, eighteen months old, after operative treatment in accordance with the described method by operation upon the lip at two months old, the hard palate at six months, and the soft palate one year later. The tendency to correct development of the nares and the freedom in the roll of the upper lip are important features.

Fig. 3.

Fig. 4.

Fig. 3. Boy twelve years old. Previous history shows that an attempt was made to force the sides of the palate together by the use of wires. This and a series of other operations at various times all failed.

Fig. 4. Same boy as shown in Fig. 3 after both lip and palate have been completely closed.

this aspect of our subject that demands earnest attention at this time even to the subordination of all other considerations, for it is obvious that a method is only valuable in proportion to its effectiveness in this respect. Study of the literature pertaining to harelip and cleft-palate operations reveals a strange confusion concerning the question of the actual results of the methods that the various writers advocate.

Estimation of benefit. Unquestionably eminent and duly conscientious surgeons have been misled, and thus their statements have been influential in misdirecting the efforts of a large following with more or less ultimate general disappointment, simply because their estimation of the effect of the surgical measures employed and recommended was not sufficiently far-reaching.

Common point of view. After a somewhat extensive opportunity for observation during the many years that I have made this division of practice practically my life work, and with more or less intimate personal acquaintance with the advocates of some of the different methods of operation for the correction of these defects, I am convinced that there can never be a proper settlement of the vexed problems involved until a common point of view concerning the purposes and influences of the several operative procedures has been established. For example, if the mere covering of a palate fissure with tissue is to be the standard of success, then all the generally recognized methods must be entitled to appreciation, because this result undoubtedly can be accomplished in a more or less considerable proportion of cases by any of them. If, on the other hand, effective speech improvement be the determining factor, at once a wide range of distinction must be recognized, the determination of which is dependent upon many modifying factors. Again, if favorable or unfavorable developmental conditions and their influence upon cosmetic effect, general growth, and health, as well as involved nervous states, are to be included with speech improvement, as they certainly ought to be, then the right of each method to continued recognition must stand or fall according to the rating of its effect upon the individual. Since the *raison d'être* for every such operation depends upon its possibilities to restore speech, increased health, comfort, usefulness and happiness, to those who bear the mark of these sad afflictions, their measure of surgical effectiveness must be according to all of these considerations and all that their acquirement may involve or supply. It is at once apparent that in broadening our point of view we have opened up an almost unlimited field for discussion, but, fortunately, the most vital factors in control of these desiderata are inexorably affected by the dependence of post-operative physiologic activities upon the character and nature of the surgical treatment; thus by process of elimination the number of operative methods which may be considered desirable are correspondingly reduced.

The standard of staphylorrhaphy. The principles which should govern the choice of operation in cleft-palate cases may be enumerated as follows: 1. Never correct a deformity by surgical or other forcible means if such defect may be made to correct itself in the natural course of development. 2. Never destroy any structure that may be required for the perfection of future developmental processes. 3. Never misplace or so dis-

arrange the form or situation of any tissue in such manner as to impair its future functional usefulness. 4. Never exceed the reparative possibilities of tissue in flap formation by endeavoring to close completely at one operation the palate fissures of cases in which this is inadvisable. 5. Aim to improve, by operation if necessary, such operative conditions as cannot safely be overcome immediately.

Destruction of the premaxilla. The first two considerations would seem to bar, not only the old and already discarded methods by which the premaxilla was removed or partially destroyed, or otherwise forcibly injured in order to facilitate the closure of the lip fissure, but also the plan of treatment by which the sides of the palate fissure are forcibly brought together in early infancy and held in contact by wires and metal plates. Surgeons everywhere have long since learned that lip fissures can be closed without such destruction of the premaxilla and the unavoidable injury or loss of the tooth germs which it encloses — an effect that is unavoidably associated with this treatment. The hideous examples of the deformed mouths and faces that these patients present in later life are only too eloquent in their silent condemnation of this procedure.

Defects of wiring and compressing the maxillary bones. Compression of the upper maxillæ in early infancy also endangers the developmental processes upon which the future form of the nares, the palate, the upper dental arch, and the face depend. Such compression cannot fail to cause an unnecessary degree of deflection of the nasal septum and marked narrowing of the nares. Wires employed for retention purposes when passed through the upper maxillæ of an infant inevitably destroy from one to four or more of the developing tooth germs; therefore these teeth do not erupt. Without the eruption of the full number of teeth there cannot be a normally shaped dental arch or palatal vault. It is obvious, then, that with intranasal deformity there must be a tendency to nasal disease, that with arrested maxillary development there cannot be a symmetrical face, and with a contracted palatal vault, as well as an irregular dental arch, the best speech function is impossible. Figs. 3 and 5 show the results of this treatment in these cases, and many similar examples might be shown if necessary to prove that such effects are not uncommon.

Flap-reversing operations. Judged in the light of recognition that physiologic action in the performance of the speech function is necessarily

Fig. 5.

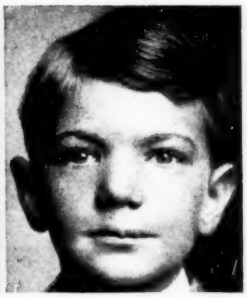


Fig. 6.

Fig. 5. Boy nine years old. Previous history shows that an operation was performed in early infancy in which an endeavor was made to close the palate by the use of wires through the jaws and lead retaining plates. This failed disastrously, and was followed by four other operations with only partial success. The difficulties were enormously increased by the effect of the early infancy operation.

Fig. 6. Same boy as shown in Fig. 5, after lip and nose have been reconstructed and the palate fissure closed by two operations. It was necessary for me to readjust the malposed parts and partly close the palate fissure at the first operation, and to complete the closure one year later. Since this picture was taken, he has been for several years under treatment by his dentist, who has been endeavoring to bring the malposed teeth into proper alignment.

dependent upon the restoration of palate tissues in natural anatomical relation, it would seem that flap-reversing operations for palate-fissure closure, by which the mucoperiosteum is turned upon itself in such manner as to reverse its normal situation upon one side of the palate in order that it may be laid across the opening and sutured to a similar flap raised but not turned over upon the opposite side, could not give the best results. While this method may, and doubtless often does, simplify the actual difficulty in operative performance, such treatment does not insure as close an approximation to normal palatal conditions as when these tissues are retained in natural form and the flaps brought together by sliding them toward the center and taking advantage of the slope of the sides of the palatal arch, as in the von Langenbeck-Warren type of operation. There can be little doubt of the importance of the difference in speech effect that these distinctions presage in surgical selection.

Ferguson operation. The Ferguson operation, by which bone and mucoperiosteal structures are carried together from chisel or saw cuts through the bony palate upon each side, appears to offer the best possible means of adjustment at the central portion of the palate where the hard and soft palates are united. This ought to

Fig. 7.

Fig. 8.

Fig. 7. Shows the usual tendency to increased deformity that follows when the lip and palate structures have been malposed in early infancy.

Fig. 8. Same man as shown in Fig. 7, after the philtrum of the upper lip and the columna of the nose have been readjusted and the associated parts brought forward.

be most favorable to speech, but the objection to this method lies in the fact that if the bone on either of the flaps should be destroyed by sloughing there could not very well be regeneration of the lost portion of the palate, and the situation of such a case would be practically hopeless. Inasmuch as it is sometimes necessary to perform operations the effect of which shall be constructive rather than complete in very difficult cases, this objection is a serious one.

Von Langenbeck-Warren operation. The von Langenbeck operation, with certain modifications that have suggested themselves in the course of my work, has given me my best results; but any specific method of performing staphylorrhaphy alone is, after all, insufficient to meet the demands of these cases.

Systematic treatment. Only by systematic treatment from the very beginning in infancy can the greatest benefits be conferred upon these individuals. It is the development of a complete system and the perfection of technique rather than new original operations that I have long believed were most to be desired in the care of these patients. The system that I have adopted and the modifications of the von Langenbeck operation that I employ have been fully described and illustrated in my work, "The Surgery of Oral Diseases and Deformities," and may be briefly described as follows:

Adhesive strip across lip. The adjustment of an adhesive strip from the malar region upon one side across the lip fissure in infant cases to the same region upon the opposite side of the face calls into play the child's muscles which would otherwise increase the deformity, and employs them as an aid in the process of narrowing the fissure and correcting the undue prominence of the premaxilla. This also tends to straighten the deflected triangular nasal cartilage; at the same time better breathing and nourishment-taking are facilitated and the infant usually thrives better. It also becomes accustomed to the restraint and does not fret or fight the sutures so much after the lip operation has been performed. By this treatment one operative step leads to the next in such manner as to reduce its difficulties, and normal post-operative development is facilitated. Figures 1 and 2, which show pictures of a case in an infant, illustrate the actual developmental results of this method.

Operative steps. The von Langenbeck operation and such modifications of it as I have found most useful may be detailed as follows: Among the most notable features is the absolute contro of the field of operation which is afforded by the mouth-gag that I use. This is a Whitehead gag changed to give a better view of the anterior part of the mouth. After paring the fissure borders the mucoperiosteal palatal flaps are raised with periosteal elevators of different sizes and bent at different angles so that the periosteum may be separated from the bone surfaces with the least possible amount of traumatism. Since the slope of the sides of the palate upon each side of the fissure vary in different individuals the direction of the force applied, which is largely governed by the form of the periosteotome, is an important matter. My staphylorrhaphy needles are of different sizes and curves in order to meet the requirements of suture insertion in the anterior, middle, and posterior portions of the palate with the least possible injury to the flap tissue.

One aluminum bronze wire retention suture, with small very thin silver button plates to secure it upon each side, is placed through the central portion of the soft palate. The silver plates are secured by lead shot clamped upon the wire and are so situated as to have the resistance of the thickest part of the muscular tissue of the soft palate. The intervening tissue is less likely to cut and slough if swelling occurs than it would be if included within the loop of a complete suture. The coaptation sutures are of formalized pyoktanin gut. This retains its integrity long enough to permit union to take place, and after that its disappearance is an advantage. There is much difference of opinion with regard to lateral incisions in these cases, and the correct decision in this respect quite naturally depends upon the width of the fissure and the character of tissue involved. But entirely aside from the question

of the relief of tension, which is undoubtedly given by liberation of palate tissue in this manner, I am firmly convinced that better speech results are favored by incisions on each side downward and backward behind the molar teeth, following as nearly as possible the lines of the muscular raphé, and the carrying of the soft-palate muscles bodily toward the central line.

Nasal form important. Next to the form and character of the tissue that may be obtained as a covering for a palatal fissure by uranostaphylorrhaphy, the most important feature is to secure a good nose. Not infrequently in cases in which the speech improvement has been disappointing, although the appearance of the result of the palate closure was all that could be desired, I have found that an unusually large naris or other nasal defect has been largely responsible for this disadvantage. Much benefit has been given these patients by surgically raising the floor of the nose, reducing the defective form of the cartilaginous wing upon the affected side, and such general intranasal and extranasal reconstruction as seemed to be required to aid this portion of the speech apparatus. The effect of this treatment is often exceedingly gratifying to both operator and subject, and it should receive more attention than hitherto deemed necessary. (Figs. 3, 4, 5, 6, 7, and 8.)

Speech relation of age and operation. There is much to be said upon both sides of the question as to whether the best speech is obtained by palate closure before the child begins to speak or afterwards when wrong speech habits must be overcome. Theoretically, it should always be necessary to have the palate fissure closed before the child begins to talk. Practically, this is not always so, and the decision depends upon many modifying factors. In order to be on the safe side I make every effort to provide as perfect a palate as possible at a sufficiently early age to make sure that no adverse speech habits have been acquired. Therefore all operative procedures are completed, if possible, before the child is 2 years old, and preferably at 18 months or even earlier. Nevertheless it is true that some of my best results, as evidenced by freedom from the characteristic cleft-palate speech sounds, have been secured with patients whose ages at the time of the palate operation varied from nine to sixty years, and some of the most imperfect speech results have been with patients that were completed before they were two years old. The natural conclusion from this, especially when one considers another class of cases in which there is defective speech of similar character due to imperfect form in development of hard or soft palate, although without any indication of a cleft, is that perfection or imperfection in form is of paramount importance and often a more active factor in determining the speech results after cleft-palate operation than the speech habit difficulties which have been hitherto considered of first importance.

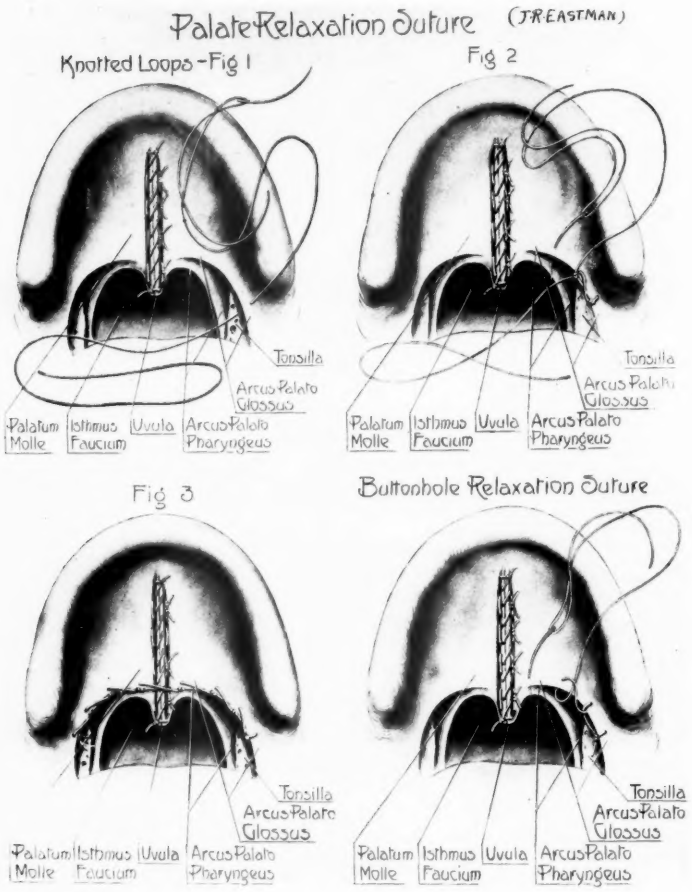
FACTORS OF SAFETY IN CLEFT-PALATE SURGERY[1]

By JOSEPH RILUS EASTMAN, M.D., F.A.C.S. Indianapolis

IN the Langenbeck or similar flap operations there will be much less likelihood of separation of the wound margins, and consequent failure of union, if the mattress coaptation sutures, after being reënforced by a simple running suture, are further supported by a continuous relaxation suture passing around the free edge of the anterior palatine arch.

The anterior part of the soft palate, for a distance backward of eight or ten mms. from the edge of the hard palate, contains practically no muscular fibers, being composed almost entirely of palatine aponeurosis. Therefore, the anterior portion is much less movable than the rest of the soft palate. The tensor palati acts upon this part of the palate but as this is usually divided when the Langenbeck flaps are dissected up, it is not an important factor in causing separation of the wound margins. The posterior and large part of the soft palate contains muscular fibers in abundance and is freely movable, being the portion upon which most of the palatine muscles act. The supporting or relaxation suture referred to, follows the course of the palatoglossus muscle or constrictor isthmi faucium. As a rule, the use of this arch suture obviates the necessity of division of the levatores palati and palatopharyngei muscles. This affords a decided advantage since the section of these muscles reduces the blood supply to the flaps and can have only a harmful effect upon subsequent phonation. Fine celloidin linen or von Brun's hemp, such as

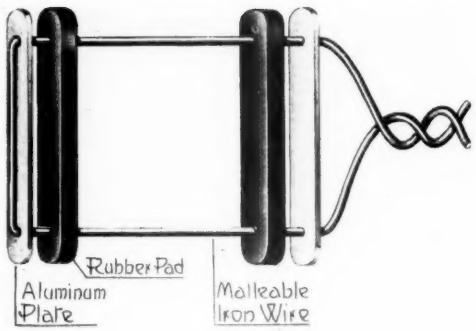
[1]Read before the Clinical Congress of Surgeons of North America, London, July 27, 1914.



is used for the mattress sutures and the continuous coaptation suture should be used for the suture which is to immobilize temporarily the anterior palatine arch or arcus palatoglossus.

The immobilizing suture may be introduced as a series of knotted loops or as a running buttonhole suture. The former is the more secure. The knotted suture is introduced by passing a small curved needle bearing the long linen or hemp thread through the edge of the anterior palatine arch on one side near its base, that is, near the side of the tongue. The thread is drawn through to its middle and secured with a reef knot, leaving the tail of the suture long. At a distance of three or four mms. from the first or outermost knot, the needle is again passed through the edge of the arch; the tail of the suture is taken up and another reef knot tied. This process is continued around the anterior palatine arch to its base on its opposite side, the suture crossing in front of the base of the uvula. The manner of applying the running buttonhole suture requires no explanation.

Such a suture immobilizing the anterior palatine arch reënforces the coaptation sutures against the traction incident to deglutition. In cases in which there has been failure of union in the anterior part of the soft palate, the use of the arch suture described has established union of the posterior part of the soft palate, followed promptly by closure through granulation of the forward defect. Such a suture is much more secure than the mattress suture for the reason that tension is distributed over eight or ten points



instead of but two and the danger of cutting out is proportionally lessened.

General anæsthesia was never of much value in cleft-palate surgery and with the present development of local anæsthesia, may be said to answer no valuable purpose. Elimination of the general anæsthetic and employment of local anæsthesia removes many of the dangers of palate surgery and adds greatly to its simplicity. If adrenalin be added to a solution of novocaine, the technical difficulties are diminished in a surprising degree as hæmorrhage then becomes negligible. The lessening of hæmorrhage is not only important because it renders dissection of flaps and the passing of sutures so much easier of execution on the bloodless field, but also, because it safeguards the patient against shock and serious disturbances of metabolism. Local anæsthesia protects against shock not only by minimizing hæmorrhage but also by acting as a nerve-block.

If the solution used is not too strong, that is, not stronger than an aqueous solution of 0.5 per cent of novocaine (1–200) with 0.02 per cent of adrenalin (1–5,000), the danger of slough is inconsiderable. In the new-born, ten to twenty drops of this solution on each side suffice to induce anæsthesia and blanch the tissues.

In the Langenbeck operation the point of the hypodermatic needle should be entered, slanting inward, along the line of the lateral incisions, to be made for dissection of the lateral flaps. The forcing of the fluid under the mucoperiosteal flap facilitates the subsequent dissection. The solution should be injected by gentle pressure from the line of the lateral incision toward the free edge of the cleft to the end that paring of the edges of the cleft may be attended by minimal hæmorrhage. If local anæsthesia be used, the head of the patient may be placed in any position to suit the convenience of the operator without danger of blood entering the air passages.

In extensive operations the swallowing of more or less blood is almost unavoidable. No matter what position is used or what precautions are taken some blood is usually drawn into the stomach during the repair of cleft palate.

After an extensive palate operation, the blood is sometimes discharged in vomitus but more often it is passed off by the bowel. The presence of this blood in the stomach of an infant or small child is not infrequently productive of serious disturbances of metabolism. The symptoms arise usually very soon after the deglutition of the blood, sometimes within a few hours. The absorption of the pyrogenic constituents of a large quantity of blood quickly induces a high fever. The pyrogenic substances here concerned are probably identical with those which cause the so-called "aseptic surgical fever." It is established that solutions of hæmoglobin have a pyrogenic action. Schimmelbusch isolated from the blood a pyrogenic ferment, hystocym, and has demonstrated that this body, which is a product of the normal metabolism, when introduced into the circulation in sufficient quantities can give rise to high fever.

By others the heat producing property of blood has been attributed to fibrin ferment and the nucleins.

Whether these substances actually produce heat or merely interfere with heat elimination is not understood.

It is likely that there is some intimate relationship between the so-called aseptic surgical fever and that fever occurring in conjunction with constipation following operations. The pyrexia in either case is doubtless due to the absorption of soluble decomposing materials which are fabricated in the intestines either with or without the coöperation of bacteria.

The experiments of Schmidt and Hammerschlag led them to believe that transfusion of blood into an animal will always produce more or less fever, and that free fibrin ferment may be found in the blood of fever patients, very much more often than in those having a normal temperature. Thus it appears that some constituent of the blood, whether hæmoglobin, fibrin ferment, a nuclein or an albumose has the property, on being absorbed into the general circulation, of producing fever.

Observing infants after cleft-palate operation, it has occurred to the writer that the degree of fever varied directly according to the severity and duration of the operation, that is, the more blood swallowed the greater the pyrexia. It is possible that the direct absorption of blood from

the stomach does not produce the fever in these cases. It is, of course, possible that the presence of the blood simply leads to fermentation of other intestinal contents with consequent disturbance of metabolism, but, however this may be, the fact seems established that the blood in the stomach of an infant is either directly or indirectly thermogenic and is therefore a serious menace because of the high fever which it may induce. Conversely, it has not been difficult to show that the prompt removal of the blood from the stomach of the infant by lavage militates strongly against the development of the fever. The introduction of a medium sized male catheter and thorough rinsing of the stomach, if done promptly after palate operations, will, therefore, remove an element of danger.

In palate surgery, as in other surgery, much depends upon the selection of the appropriate operation for the single case at hand. There is little doubt but that the failure to choose the proper operation for the specific case is more often culpable for failure than any of the other recognized causes of failure. There are so many varieties of cleft palate that there can never be a single operation which will apply to all cases. There always will be many operations. The development of the art cannot eliminate them.

In many cases of narrow cleft combined with high cathedral arch, it is not difficult to coapt the edges precisely and without tension after separation of the mucoperiosteum from the hard palate.

In cases of high palatal arch, therefore, if the cleft be not too wide, it is useless to make paralyzing incisions for the relief of tension, for the two halves of the loosened mucoperiosteal palate will fall together like the two halves of a cantilever drawbridge, and may be sutured without tension if the soft palate be quite completely separated from the hard palate at the posterior border of the latter as advocated by Berry.

It is distinctly worthy of note that lateral incisions are rarely of value. With curved scissors one can nearly always free an abundant flap by beginning at the root of the split uvala on each side and cutting forward on the nasal side of the edge of the cleft.

In cases in which the hard palate is almost horizontal, with associated widening of the alveolar arch, the compression method advocated by Brophy, is not to be disregarded provided the case is seen during the first few months. I have found few cases in which the compression method was of value, and in these few instances have been obliged to follow it with a flapping operation after Lane, Langenbeck or Davies-Colley. I have not been able to prevent a slight turning inward of the alveolar processes in any case even when the root of the zygoma was partially or completely chiselled away in order to secure a high application of the plates. Nevertheless, it is a mistake to say that the Brophy plan of compression is without value. The deformities of cleft palate vary greatly. Many surgeons have denied Brophy's statement that a large percentage of cases of cleft palate are associated with widening of the alveolar arch. However, only one whose observation embraces every cleft palate everywhere, could say that this associated abnormal widening of the alveolar arch is never present. Now and then it is found in association with a flat or nearly horizontal hard palate and complete wide cleft, and in such a case Brophy's plan of compression may with good reason precede a flap operation. In such instances, Brophy's apparatus of silver wire and lead plates may, I believe, with some advantage be replaced by malleable iron wire and plates with soft rubber pads. The rubber lying between the aluminum plate and the alveolar process minimizes trauma and exerts a constant elastic pressure. Malleable iron wire is so much stronger than silver wire that its value is much greater when considerable force is required. The twisted ends of the wire should be allowed to hang out the corner of the child's mouth. Thus they are always available for twisting and occasion the least annoyance.

The end of the malleable iron wire should be brazed smoothly to the butt of a stout curved steel needle. This gives a smooth joint which may be drawn through the tissues of the maxilla without adding unnecessary laceration to that produced by the needle point.

It is an old and quite generally accepted view that to operate for cleft palate on a child under three months of age is unwise. This is, as Sir Arbuthnot Lane says, a matter of tradition. It may with reason be contended that under ordinary conditions cleft palate should be operated upon within the first week after birth.

The rule to operate early, however, should not apply to infants which are in a general physical sense so far below the norm that even a slight surgical procedure must be attended with great risk. The physical resources of such an infant can often be augmented by a few weeks of careful feeding. In the case of an extremely weak baby, if the cleft be complete and wide, it is probable that nothing can be gained by delay since adequate feeling is difficult or impossible and resist-

ing power is steadily reduced, by the breathing in of cold air through a roofless mouth. G. V. I. Brown who counsels in favor of a reasonable delay to the end that the operation can be done with the proper assurance of safety does not deny the advantage of early operation, if conditions are favorable.

The very fact that the infant has just passed through the birth canal, with all the brutal mechanical insults which may be incident to this excursion, suggests the presence of a tolerance to traumatism which becomes less in evidence as the infant grows older.

In ordinary cleft-palate operations under local anæsthesia during the first week, the loss of blood should be trivial, but however this may be, the danger from loss of blood is not greater than at a later period. Experience has not suggested the slightest foundation for the truth of the statement that young infants do not bear the loss of blood well. If there is any reliable evidence to the effect that a very young infant does not bear the loss of a given proportion of its blood as safely as an older individual, we have no knowledge of it.

The vital resistance against trauma and hæmorrhage of guinea pigs and rabbits has a higher index upon the day after birth than upon succeeding days. Prof. B. D. Meyers, of Indiana University, states that a baby rabbit can be operated upon up to twelve hours after birth without an anæsthetic and with no apparent perception of pain, there being no outcry during such a procedure as the enucleation of an eyeball. Eighteen hours after birth such operations cause the animal to cry out.

Meyers calls attention to a probable relationship between these phenomena and the circumstances that at the time of birth the sensory nerves are in an imperfect state of medullation and are, therefore, not good conductors.

It is not known at what time medullation becomes complete in the human. Osmic acid is known to blacken medullated nerves but the nerves do not blacken with this agent up to fourteen hours after birth.

Another phenomenon of interest in this connection may be noted by removing first the heart of a rabbit twelve hours old and then that of another rabbit twenty-four hours old. The heart of the twelve-hour rabbit will continue to heat for an hour and a half whereas the heart of the twenty-four hours' old animal will cease almost immediately.

This single phenomenon, if it may be taken to indicate anything, suggests a marked difference in vitality (even if it be of an automatic sort), or a great difference in sensitiveness to external influences. After early operation the nasopharynx is focibly dilated and developed by breathing. Nutrition is not impaired and the child is brought into normal condition before speech defects are established.

There is little doubt but that surgeons who make a rule to operate in the second or third year will have a lower mortality rate than those who operate early. The reason for this is not far to seek. Only the strongest survive the two or three years without early operation. The late operations are, therefore, good surgical risks. How large a percentage of those which are not operated early perish from disturbances of nutrition before the third year, it would be difficult to estimate. It may safely be conjectured that the percentage is high. Many of these can be saved by early operation.

ON THE TREATMENT OF CLEFT PALATE [1]

By F. W. GOYDER, M.B., F.R.C.S., Bradford, England

ENGLISH surgeons have often been charged with ultraconservatism in their ideas and methods, and there is no doubt that the reproach is sometimes just. Energetic and ingenious men have in the past devised new methods of dealing with old subjects, but tradition and inertia have caused the methods to be neglected and the ideas to lie fallow. However, surgery is a progressive science, and such hindrances are almost of the past. Although scientific progress consists in a succession of forward steps, it is often necessary to call a halt, that a faithful review of the advancement made may be taken. That is one of the functions of a congress such as this. A forward step is not necessarily always in the right direction, and bearings must be taken to discover whether the new departure is an improvement upon the old position. It is necessary

[1] Presented in the Symposium on Treatment of Cleft Palate, Clinical Congress of Surgeons of North America, London, July 30, 1914.

to take new steps if the old position is found to be unsound, but it may be necessary to retrace one's steps if the new position is found to be worse than the old. To apply this metaphor to the subject under discussion, we can truthfully say that operation in childhood is an improvement over operation on adults, for cleft palate. It is a step in the right direction. Can we as truthfully say that operation in infancy is better than operation in childhood? Has operation in infancy been a step in the right direction? There is only one way in which such a question can be decided. It is by the publication of a consecutive series of cases giving the full details of the results of any given method of operation. In England, for the later operation, abundant evidence has been produced in the wonderful series of cases published by Mr. James Berry. We know exactly what results can be achieved by Langenbeck's operation performed at or about the age of three years. We know that the results as regards speech, although by no means ideal, can be made almost ideal if persistent efforts are made in re-education. It has been assumed that operation in infancy prevents the formation of faulty habits of articulation. This may be so or it may not. In England we have no figures either to prove or disprove it. Until we obtain them we are in no position to judge of the superiority or the reverse of the method. If the members of this congress will give us, as I am sure they can, these missing data, we shall be in a position to settle once and for all this much disputed matter. Many English operators feel that if we could only get at them, the results of early operation would turn out to be at least as good as the results of operation in childhood; but no such belief, in the absence of figures, is of any value as evidence in a question such as this. As they stand, in this country, the published records are strongly in favor of Mr. Berry's claims.

Speaking personally, I was brought up in the school of Sir Arbuthnot Lane. I have the greatest admiration for his inventive genius and his operative ability, and considerable faith in his methods of dealing with the problem. I have employed and do still employ his methods, though not exclusively. But I believe that each case of cleft palate must be dealt with on its own merits and therefore that there can be no fixed age for operation. If deaths following operation are to be avoided, as they can be, it is only by the careful choice of the most favorable moment for operation.

A point rather frequently lost sight of is that Lane's methods are applicable at any age, while Langenbeck's, unless preceded by some such operation as Brophy's, is impracticable in infancy. I have endeavored in my Jacksonian essay to show that, after early closure of the harelip, complete clefts of the palate can usually be closed by Lane's method at or about the age of twelve months, without using a flap large enough to uncover the unerupted teeth; so that while retaining the advantages of early operation, the danger of damage to the teeth can be avoided, and an effective soft palate can be fashioned. I hope to be able to show, in the course of time, that good speech and a good functional palate is the result of this modification. But until some time has elapsed, I must judge by the results of other operators, so that I should welcome the views of those here to-night on the following points:

It has been repeatedly said, and copied from one article to another, that early operation "prevents the patient from getting into the habit of articulating into the cavern of the nose," or "that the child will learn to articulate without the so-called nasal speech, because when he learns to talk the cleft has already been closed" (F. N. G. Starr, Toronto). I should like to ask, In what percentage of cases, if in any, have children, operated on in infancy for cleft palate, developed normal speech? This seems to me a fundamental question. Consider for a moment the effect on the position if these claims turn out to be well founded. The child will speak normally from the first, and no special training in speech will ever be necessary. Hence early operation would be put in a very strong position; special speech training is invariably necessary after operation in childhood if only because bad habits have to be corrected. A majority never speak normally. A slightly greater mortality after early operation would hardly outweigh the advantages of perfect speech. I am beginning, most reluctantly I admit, to come to the conclusion that very few children speak normally without special training after cleft-palate operations in infancy. I may be wrong. I hope this meeting will prove that I am. I have endeavored to show, in the essay to which I have alluded, that if the soft palate is not mobile or not sufficiently long, normal speech will not occur even though the operation is performed in infancy. Mr. Brophy's method, more than any other operation in infancy, should result in an effective soft palate. I should expect, then, that his percentage of good speech results would be higher than that obtained by operators by other methods. It would be interesting to compare views on the necessity for length and mobility in the sutured soft palate. My own belief is that

length is more important than mobility, but that given an intelligent child and adequate training, neither is essential to an ultimately good result.

I should like, also, to ask the exponents of the later operation whether the soft palate after operation is ever as long as it should be. I am inclined to doubt if it ever can be.

Another important question is the percentage of cases in which the united segments of the palate come apart some time after successful suture.

The question of mortality becomes of importance only when it is proved that early operation gives better results as regards speech than does the late. If the results are about equally good (or bad, as the case may be), that operation must be chosen which has the lowest mortality. But as we all know, in operations on infants a low mortality is the result of selecting the most favorable period for operation and of most careful and skilled nursing. At the same time, the operation must not be too severe or last too long. As to the remote mortality, I have noticed with interest that of the cases upon which I operated in infancy very nearly all are alive, while of the cases in which operation has been deferred, the mortality, chiefly from respiratory troubles, has been considerably larger. I am not urging early operation as a life-saving procedure, but merely pointing out that cleft palate does add to the risks of life especially in early years.

I should be glad to learn from Professor Keith why left-sided clefts of the lip and palate are so much more common than right-sided ones. Also whether I have any ground for my belief that at birth the divided segments of the soft palate contain less tissue than the normal soft palate at the same period of life.

To my mind, a complete record of a case of cleft palate should include —

1. The type of cleft.
2. The age at operation.
3. The details of operation.
4. The result as regard appearance, scarring, mobility, and length of palate immediately and ultimately.
5. The result as regards speech after a sufficient interval has elapsed.
6. Speech if any, previous to the operation, and the mental capacity of the child.
7. Speech education. Whether it has been available or made use of.
8. The nutrition of the child at the time of operation.
9. Antenatal pathology. From the point of view of antenatal pathology many points, such as the ages, nutrition, and position of the parents, a pedigree of the family, previous illnesses of the parents (especially syphilis), are of great interest.

But the first and most important duty of a surgeon interested in this difficult branch of work is to keep full and accurate statistics especially as regards speech, not only for his own use, but for the advantage of other members of his profession and thus to carry out the objects for which this great congress was formed.

Finally, let us consider what position we are logically bound to take when we have full figures to guide us. If it is shown that early operation prevents in a fair percentage of cases the establishment of cleft-palate speech, and that in the remainder education corrects it, we must adopt early operation if the mortality is not excessive; and the sole remaining question is a choice of the method — Brophy's, Lane's, or the method of some other surgeon. If, on the other hand, early operation shows no improvement over the later as regards speech, we must be guided by the relative risks and dangers of the various methods.

The sole reason and excuse for this paper is to point out the importance of facts and figures. New methods are inevitable if surgery is to progress; new developments are legitimate and essential; but until their authors can show statistics justifying the faith that is in them, these methods cannot command for any length of time the attention and support they deserve.

THE LATE RESULTS OF CLEFT-PALATE OPERATIONS[1]

By TRUMAN W. BROPHY, M.D., D.D.S., LL.D., F.A.C.S., Chicago

ANATOMICALLY, there are fifteen forms of cleft palate. A cleft palate is not the result of "arrested growth of the palate" or "the absence of a portion of the palatine tissues." All children who have congenital cleft palates, with rare exceptions, have in the palate the normal amount of tissue, although it is not united in the median line; it is cleft. The tissue, I have always declared, will atrophy if not put to use, statements to the contrary notwithstanding; but, with rare exceptions, there is at birth in these cases a sufficient amount of tissue to close the cleft and bring the upper arch into harmonious relation with the lower one. In rare cases in which there is a deficiency of from five to ten millimeters I move the bones together and close the cleft. Many narrow arches, much narrower than this, are easily expanded by the orthodontist.

The statement that "at all ages the upper jaw is broader than the lower" is not based upon actual measurements or upon careful clinical observation. A cleft-palate jaw is almost always broader than the lower, but the normal upper jaw is always narrower than the normal lower jaw. Especially is this true if measured from second bicuspid to second bicuspid, above and below. In the aged, the narrow upper jaw is in striking contrast with the lower jaw, which is often one-third wider than the upper jaw.

In a young, normal infant the alveolar ridge of the maxillæ slightly laps over the ridge of the mandible. In a cleft-palate infant the force exerted by the mandible drives the maxillæ farther and farther apart and widens the cleft. The tongue of a cleft-palate child rests in the cleft and extends into the nasal passage. The tongue, no doubt, interferes with union, and the force exerted by the mandible increases the breadth of the cleft. The primary cause of cleft palate and harelip has been pointed out by Bödecker as the epithelial lamina which dips down deep into the submucous tissue to form tooth enamel. I believe this is the first public statement made of Bödecker's theory. Laboratory work will demonstrate that he was either right or wrong.

Prenatal impressions may be a factor in causing failure of union. Proof of this, however, has never been established. Defective nutrition or the general debility of the mother during early months of gestation may delay union. Heredity is unquestionably a powerful influence.

Operations upon the palate are divided into two general classes: Operations in early infancy (i. e., before the sixth month) and operations at a later period.

Early operations. A wound is a cleft of the tissues. A cleft palate is in every sense like a wound. If an infant were thrown from a vehicle and his palate split, would the surgeon advise waiting a few years before closing it? No. The first impulse of the surgeon in the presence of a wound is to close it. He should so treat a cleft palate.

The immediate effect of an operation upon the palate in early infancy, i. e., before the age of five months, is the marked improvement noticed in the general nutrition of the infant. He is now able to take his food through the nipple with comfort, and as a result he gains in weight and strength. In closing the cleft, the dental arch becomes normal and the line of union quite firm. The child is changed from one who is constantly fretting and ill to one who is contented. If this individual is seen ten to fifteen years after the operation, one will note that the dental arch has not become deformed or in anyway different from an arch in one of the same general features who has never had a cleft palate. The teeth occlude properly and the line of union in the upper jaw is hardly discernible. The line of union in the palate is noted by a faint line, and on pressing the hard palate a firm bony arch is felt. The soft palate has developed and will equal in size, strength, and flexibility a normal one. If the operation is properly performed, the opening between the nasopharynx and throat will be such that normal functions will be secured. As most of these patients have harelip in conjunction with the cleft palate, it will be noted that the line of union in the lip and nose is represented by a faint white line and that the normal cupid's bow is present. The alæ of the nose are perfectly formed and the nasal septum is straight, unless the patient has suffered with adenoids or other diseases tending to promote nasal deformities. On speaking, no difference is noted in phonation, nor does he find any difficulty in compassing any vocal effort.

Only two operators have devised plans for the correction of cleft palate in early infancy — Sir Arbuthnot Lane and myself — and we both have been criticized more or less severely. As to the points at issue in Mr. Lane's work, I cannot

[1] Read before the Clinical Congress of Surgeons of North America, London, July, 1914.

make a statement; but as to my own work I am satisfied that other surgeons have not succeeded in doing the operation because they do not understand the technique. My methods have been presented by some authors to European surgeons in a manner so faulty that failure would necessarily result if their illustrations were followed. The broad statement that deformed parts should be corrected early and brought to as nearly a normal position as possible, is so obviously true that I believe no one should question it. Many surgeons are of the opinion that infant operations are not expedient since tissues break down and stitches cut out, following an operation. With the improved technique, however, such unfortunate results should be avoided.

I have seen infants upon whom Sir Arbuthnot Lane has operated and whose palates have been completely closed. I have not, however, had the opportunity to study them with a view to ascertaining the quality of their speech. Mr. Lane does not seek to secure a bony union, but closes the fissure with a flap. A solid bony arch, therefore, would not be produced. The test of his work will be the condition of the parts in adult life and the ability of the patient to speak correctly.

The operation in early infancy brings into action the muscles of the palate, and the muscles develop instead of becoming atrophied for want of use. Hence, a good velum is secured with plenty of tissue, whereas if the operation is delayed the muscles cannot as surely be made to subserve the same purpose as tissues which develop through natural employment; for the muscles of a cleft palate are not normally employed, and by operating at a very early age, they are at once brought into use and their development is proportional to other tissues. Also, if the operation is done early, there is much less deformity in the bony, as well as the soft, tissues. Therefore, the most important reason for making the early operation is that a normal condition is established which enables the child to speak as distinctly as children do who were born without this congenital defect.

Late operations. When the operation is performed in late infancy, i.e., when the child is from six to twenty-four months of age, the conditions are a little different. The immediate effects are the same, but while in some instances the alveolar borders are brought in contact by traction of the orbicularis oris muscle following closure of the harelip, the tuberosities of the maxillary bones still remain widely separated and the posterior part of the cleft consequently will also be widely separated. This separation might have been avoided if the bones had been approximated at the proper time. As the patient grows older the difficulties increase in operations upon the palate. The palate produced by the operation at this time of life is not, strictly speaking, normal. It usually differs in this respect: the arch is broader and remains broader. The wider the cleft the shorter the velum, and, therefore, the soft palate does not approach the posterior pharyngeal wall as it normally should. When the palatopharyngeal muscles have in part been added to the end of the velum, the palate is made to reach the posterior pharyngeal wall. In broad clefts the upper teeth usually occlude correctly with the lower. To accomplish this the mandible becomes wider. Therefore, as the result of the cleft at this time of life, the jaws in the region of the molar teeth have become wider than normal. The nose of a patient having single harelip and complete cleft is almost invariably deflected to the side opposite the cleft, and the nostril into which the harelip extends is widely expanded; the face is asymetrical, but it is not always conspicuous, and phonation is not as clear unless the palatopharyngeal muscles are in part utilized to lengthen the velum. The parts brought into play by the act of speaking are not as fully developed as in patients operated on in early infancy, the muscles have failed to develop from disuse.

If time permitted I could enter into more detail, but I wish to state that the results of my operations have proved by the test of time that the following statement which I have so often made is true: "To obtain the best results, the operation should be performed in early infancy, preferably before the third month."

Cutting or breaking the bones of the hard palate to secure union is an unnecessary procedure. The lateral incisions of Langenbeck, Ferguson, and Agnew, which were, and still are, regarded by some surgeons essential to relieve tension, must, in the light of modern methods, be discontinued. In 1883, I used, in the soft palate, wire tension sutures and large, long lead beads to suspend action of the muscles and to hold the edges of the fissure in proximity. After union took place these beads were removed. A little later I substituted lead plates for the beads and have found them indispensable.

Lateral incisions in the soft palate are unnecessary and should never be made for the following reasons:

1. The ascending palatine or the large branch of the posterior palatine artery is divided, thus causing unnecessary hæmorrhage.

2. The blood-supply to the palate which we so much need is in a great measure cut off.

3. A new field for infection is established.

4. The nerves are divided, and atrophy may result.

5. If the tensor palati muscle is completely divided it never reunites, and, consequently, an important factor of the palate is destroyed.

6. The tensor palati muscle by traction dilates the pharyngeal artifice of the eustachian tube. If its function is destroyed defective hearing must ensue.

7. The scar tissue which forms following the incision makes a thick, clumsy palate without that flexibility and resiliency so essential to perfect function.

8. The palate is made shorter instead of longer as it may be made by dividing it from the posterior border of the horizontal plates of the palate bones and using lead plates and wire sutures to relieve tension.

Finally, to attain the highest degree of success and to avoid infection, we should use sutures which cannot absorb secretions: horse-hair, silver wire, and lead plates.

A cleft palate may be closed, but phonation — correct speech — is the supreme test of the surgeon's work.

Dr. Truman W. Brophy, closing the discussion of his paper on "The Late Results of Cleft Palate Operations," said:

I have brought from America three patients to exhibit to you their powers of phonation. It is an easy matter to make declarations as to the ability of patients to speak, following cleft-palate operations. I do not intend to dwell for any length of time on this phase of the subject. The patients will speak to you themselves and it will remain for you to determine whether the result of the work done, according to my own methods, has been successful, and whether the object desired, in securing for the patients perfect speech, has been attained. The patients were operated on at different ages.

The first one was thirty years of age when the operation was done. She wore an artificial palate for several years before I operated. I have it here. You will observe that this was a very broad cleft, the kind that many surgeons believe inoperable. This cleft was closed without making a Langenbach lateral incision. As I remarked in my paper, I regard these incisions as absolutely unnecessary for the purpose of closing the soft palate. To effect a union and secure a soft, flexible, useful palate, the tissues must be elevated, wire tension sutures adjusted and fixed upon lead plates.

You will observe that the palate is soft, flexible, and unmarked by scar tissue, which almost always follows when lateral incisions are made, and that it reaches back to the posterior pharyngeal wall. You will also note that her articulation is perfect. She speaks so distinctly that the most critical observer cannot detect the slightest defect in her voice. This, however, does not always follow an operation which yields the same result as in this case, so far as the operation itself is concerned. Many times where the operation has given equally good results the patient must be taught how to use the lips, the tongue—in fact, all the parts that enter into the formation of speech.

You will notice that all I have claimed regarding the operation for adults is demonstrated to be true in what Miss Miller has said in regard to perfect speech. I am satisfied that such results, provided the palate is not mutilated by the formation of scar-tissue, can be secured in nearly all cases, provided the patient is taught the mastery of his vocal organs. It only shows that one who is determined to overcome the habits which were acquired in infancy, and which have clung to her through youth and early womanhood, may succeed in speaking perfectly.

The next patient was operated on when nine months of age. She speaks English, French, and German. Her articulation is absolutely perfect. Her command of these languages is such that no one would suspect that she ever had a cleft palate. The young lady feels that she escaped the acquiring of defective speech because she was operated on before she was old enough to begin to talk.

The third patient was operated on when three months of age. In his case there was a broad cleft of the entire palate with harelip, and the nose was deflected to the side opposite the cleft. On examination you will see that his dental arch is so well formed that one would scarcely realize he had harelip, and you will see that he has normal nostrils and his nose is straight. He also has normal speech. It would be hard to convince the mother of this boy that it would be wise to defer operation for cleft palate until the child is old enough to talk. His teeth occlude well. He has but one tooth absent, and that is the lateral on the side of the cleft, which never erupted. As you know, this tooth is often absent in cleft-palate patients. If present, it is so much diverted from its proper position that it has little usefulness. This little boy is now eleven years old; he has made excellent progress in school, and he is one of the best informed boys of his age that I have ever met.

In answer to a question that has been asked regarding the disturbing of teeth in moving these parts together, I would say that in my earlier experience I did disturb teeth in carrying sutures through. I later found that careful manipulation when the point of the needle came in contact would enable the operator to carry the needle between the teeth and, by so doing, avoid disturbing them.

CORRESPONDENCE

CONTROLLING HÆMORRHAGE AFTER SUPRAPUBIC PROSTATECTOMY

To the Editor: My attention has been called to an article in the November number of SURGERY, GYNECOLOGY AND OBSTETRICS, on "A New Method of Controlling Hæmorrhage Following Suprapubic Prostatectomy," by Dr. F. R. Hagner.

In 1905 I devised a rubber bag and used it in exactly the manner described in this article. I am sending you a copy of the *New England Medical Gazette* of the issue of August, 1906, containing my paper entitled "A Method of Controlling the Bleeding after Suprapubic Prostatectomy." I am also sending you a reprint of my article entitled "The Suprapubic Prostatectomy with a Positive Method of Controlling Hæmorrhage," which appeared in the *Journal of Surgery, Gynecology and Obstetrics*, July, 1908. This paper was read before the New York Homœopathic Medical Society, on or about April 10, 1908.

I also desire to call to your attention Mumford's Practice of Surgery (1910), page 422, where you will find the following sentence: "If the hæmorrhage does not cease shortly with copious irrigation, one may well employ the hæmostatic tube or bulb devised by J. E. Briggs and shown in the accompanying cuts." The cuts which appear, Figs. 253 and 254, are, however, not illustrations of my hæmostatic bag, but of one by Dr. Horace Packard.

The rubber bag as constructed by me is made of thin rubber, capable of considerable distention, and varies in size from one to one and one-half inches in diameter, slightly oval in shape. To either pole of this bag a rubber tube is attached, one being continuous with the interior of the bag; the other is allowed to protrude through the suprapubic drainage opening and is of assistance in removing the bag. An olive pointed bougie is introduced through the urethra and allowed to protrude through the suprapubic incision. The end of the tube which is continuous with the interior of the bag is slipped over the point of the bougie, which is then withdrawn through the urethra. The collapsed bag is pushed into the bladder, a syringe nozzle is applied to the tube, and the bag is distended with water or air.

The mucous membrane which originally overlaid the prostate is pushed into the cavity with the index finger, approximating the mucous membrane to the underlying connective tissue. Continuous tension upon the tube holds the bag in position and stops bleeding.

Boston, Massachusetts. J. EMMONS BRIGGS.

SUPPURATIVE APPENDICITIS; POST-OPERATIVE HÆMORRHAGE

To the Editor: In SURGERY, GYNECOLOGY AND OBSTETRICS for November, 1914, page 679, I was much interested in Dr. White's article on "Post-Operative Hæmorrhage in Appendicitis Necrotica." Recently I have had a similar case which brought this article forcibly to mind.

A. E., age 24 years, married, laborer, was seen by me October 25, 1914, at 6:30 P. M. Diagnosis: acute gangrenous appendix. I advised immediate operation. Operated as soon as he reached the hospital. On opening the abdomen, I walled off in preparation for possible pus. I found, after considerable effort, a short, thick, gangrenous appendix, with pus oozing from its tip, bound down in a bed of adhesions with a part of the omentum adherent. After removal of the appendix, I examined the wound, which was perfectly dry. As a precaution I wicked with cigarette drains. At midnight, three hours later, the nurse informed me of free bleeding, pulse 125, moderate thirst. I ordered fresh air, cold drinks, and elevation of the foot of the bed. The bleeding continued till the fifth day, when I removed the wicks and used iodoform gauze packings placed firmly in the wick holes. After this the bleeding stopped. A fæcal fistula developed. I began irrigating the sixth day with sterile salt solution and in the wash appeared what was apparently a piece of necrotic omental tissue. Fistula closed; uneventful recovery.

Now in this case instead of the deep epigastric artery being involved I am much inclined to think I had to deal with a case of omental hæmorrhage due to a necrotic area. In my experience with gangrenous appendix cases and also from the observations of other surgeons, I know we get more post-operative hæmorrhages from the adherent or gangrenous omentum than from the erosion of the deep epigastric artery. Granted that the deep epigastric artery does erode from the placing of a drain or other causes, yet it is so very rare in the experience of most surgeons that I am inclined to think that Dr. White's technique of always tying off the artery unnecessary and apt to increase the morbidity and mortality of necrotic appendicitis cases. WM. G. WARD.

Lynn, Massachusetts.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD NOVEMBER 6, 1914, WITH THE PRESIDENT, DR. DANIEL N. EISENDRATH IN THE CHAIR

DR. VICTOR L. SCHRAGER described a case in which bone was transplanted into a cranial defect.

DR. WILLIAM E. SCHROEDER: About three years ago Dr. Fox and I did some work on skull defects. At that time, in one case we used a thin portion of the scapula, removing it with a French drill. We cut out a good sized piece, and transplanted it to fill in the defect, and the result was satisfactory.

In a second case for a defect in the dura I used the prepatellar bursa from the same patient to supply a dural defect and a portion of the scapula for bone defect. The result was satisfactory.

DR. L. L. MCARTHUR presented a paper entitled "A Modified Incision for Gall-Bladder Surgery." (See p. 83.)

DISCUSSION

DR. LOUIS A. GREENSFELDER: I had an opportunity a few weeks ago to see Dr. McArthur demonstrate this method, and since then I have had an opportunity on five occasions to use it. I used the method recently in a case in which the time-saving element contributed largely to the success of the surgical results. Briefly, the case was one of a largely distended gall-bladder, with a severe infection and a very acute nephritis. After the incision and rapid drainage of the gall-bladder, the amount of time consumed in the closure was so slight as compared to the usual method that it undoubtedly contributed materially to the recovery of the patient. I have certainly found this method of great benefit.

DR. A. E. HALSTEAD in presenting a case of "Transplantation of Fascia Lata to Replace Dural Defects," said: I operated on this young young man about six weeks ago for a sarcoma of the skull. The history of the case is briefly this:

When the patient was about twelve years of age the parents noticed a small lump, about the size of a pea, in the upper right temporal region. There is no history of any definite injury to the affected area. This mass continued to grow, and about a year and one-half ago the patient was operated on, a small piece of loose bone having been removed. The diagnosis made at that time was osteomyelitis of the skull. The only cerebral symptom was a slight numbness of the left hand; there was no other evidence of pressure on the brain. The tumor occupied the front part of the parietal bone, and the size of the growth can be judged from the specimen I present (3¾x2¾ inches). The excision of the skull, well beyond the tumor, was made by means of an electrical saw.

After excision, a flap was taken from the fascia lata of the right thigh. This was used to close the defect in the dura by attaching it by suture to the cut margin of the dura; the scalp was then sutured in place. The patient had no unfavorable symptoms; the wound healed by primary union without any deformity.

This operation was first suggested by Kirschner in 1909. It was first employed to close a defect in the human dura, by Körte, in 1910. Later cases have been reported by Rehn, Haberer, von Eiselsberg, Beck, and Denk. In a recent publication Kirschner has been able to collect forty-six cases. None of these are from American publications. The greatest number are from Russian clinics. Dural defects have been closed by fat, (Rehn, Körte); skin, (Wullstein); and fascia lata, as above described. The latter seems to be the most satisfactory method. The fate of flaps of fascia or fat used to close dural defects is still a matter of speculation. It is known from animal experiments and from one case which has been observed in man, that fat employed in this way ultimately disappears and is replaced, to a large extent, by fibrous tissue. Fascial transplants are more likely to remain. Lucas first suggested that the fascial flap be covered with fat on one side, and that this side be placed next to the brain. This step has been generally followed by those who have employed this method.

DISCUSSION

DR. L. L. MCARTHUR: It is evident from Dr. Halstead's presentation of his case that he does not utilize the layer of fat, after the practice followed in Germany to-day. Over the surface of

the fascia lata is a very good deposit of fat. It is the practice of Körte, Lexer, von Eiselsberg, and others to take this layer of fat plus fascia lata, turn the fat down against the brain, then suturing the fascia lata to the dura, make a new dura out of the fascia lata. The object being that if adhesions are formed, they will form between the fat and the brain. The pia, making adhesions to the fat, but the fat being mobile, makes a hygroma and protects the brain from those fixed adhesions which are apt to occur when either the dura is excised or sutured or a new dura made of the fascia lata alone. The principal reason for taking fascia lata then is that it supplies such a good layer of fat.

I showed cases of this kind at the International Congress, in March. Martin, Frazier, and Cushing have all performed these operations.

DR. HALSTEAD: I forgot to mention that I utilized a layer of fat. It would naturally appeal to any one to take a layer of fat with the fascia lata. The fat was placed next to the brain. That was not original with me, as it is done by every one who has used fascia lata.

DR. KELLOGG SPEED: A year and one-half ago I had a somewhat similar case in a very fat man, following a depressed fracture that was unrecognized. There was infection, and at the operation the necrotic and infected dura was thoroughly scraped off until we thought there was no more infection. It was a very mild staphylococcic infection, and at operation a piece of fascia was inserted with the fat side down, as Dr. McArthur has suggested. About four months later that sloughed out and the wound began to discharge again. I may say that the man had had epileptic attacks, and the operation was undertaken not so much on account of the infection of the skull, as it was to relieve him of the epilepsy. After four months the flap sloughed out, and the wound was cleaned out and packed open. About three weeks later we repeated the transplantation, primary union resulted, and after a year, there have been no more epileptic seizures.

DR. DEAN D. LEWIS: I would like to report two cases of cyst following depressed fractures in which the wall of the cyst was taken out and fascia lata and fat transplanted to supply the defect. In both of these cases the operation was done for epilepsy. One patient, a man, improved, while the other grew worse following the fascia lata transplant. The fascia lata flaps were sutured. Nearly all of these large fascial flaps were found later to undergo fatty degeneration and scar-tissue formation with extensive adhesions between the brain and the transplant.

DR. WILLIAM FULLER: I noticed a large defect in the place where the bone was transplanted, and I would like to ask Dr. Halstead whether he intends to transplant bone to fill in that defect later.

DR. HALSTEAD (concluding the discussion): In answer to Dr. Fuller, I intend to transplant a piece of bone later on to fill in the defect to which he refers.

DR. MILES F. PORTER, Fort Wayne, Indiana, read a paper (by invitation) entitled "Boiling Water Injections into the Thyroid Gland for Hyperthyroidism." (See p. 1.)

DR. C. G. BUFORD followed with a paper on "Goiter in Children." (See p. 35.)

DR. DEAN D. LEWIS read a paper entitled "Surgical Importance of the Thymus and Its Relation to the Thyroid."

These three papers were discussed together.

DISCUSSION

DR. WILLIAM E. SCHROEDER: After the very thorough talk that Dr. Dean Lewis has given you, there is very little for me to say. I have brought with me a book that contains two hundred and eighty pages on the thymus. The contents of this book have been gone over very carefully by Dr. Lewis, and he has added to it. Dr. Parker, who is to follow me, has carefully gone over the literature on the subject of thymus, and published, some time ago, a very valuable article on it; consequently it is a little presumptuous on my part to say very much about the relation of the thymus and thyroid. My experience with the thymus is limited.

In 1912, a little child, twenty-seven hours old, suffering from cyanosis and stridor, came under my observation. The cyanosis and stridor would disappear when the head was flexed upon the sternum, but increased when the head was extended. A tumor could be felt in the suprasternal notch, and the area of dullness behind the manubrium was distinct and very decided. A portion of the thymus gland was removed through the suprasternal notch, which disposed of the obstruction, and the child made an uninterrupted recovery. It is now approximately two years since the operation and the child is in good health, and no untoward symptoms have followed.

Since that time I have had under observation other cases which did not require surgical interference. My assistant has dissected a number of new-born babies, and we have found from a surgical point of view that the thymus acts mechanically in two ways. There are certain cases which show that the thymus is large and compresses the trachea. Then there is another class of cases in which the thymus is so large that it undoubtedly causes embarrassment to the pulsation and muscular contraction of the heart.

So far as the thyroid gland is concerned, I have a profound respect for Basedow's disease. I do not like these cases, and there is no truth in the statement, so far as I can see, that the patients who have died have had enlarged thymus glands. I have seen them myself at the post-mortem table. At times, they did have thymus glands, but when you take those cases that have a pulse of 180 with a tremor, exophthalmos, tachycardia and dilated heart, they have shown no enlarged thymus glands. I regard that as sufficient evidence that it is unnecessary to classify those cases that die as cases having enlarged thymus glands. I do not believe that there is any proof shown to date by the various experiments that there is a relation between the thymus gland and the thyroid any more than there is a relation between the parathyroid and the thyroid gland. These glands, as far as I can see, have distinct functions of their own, whatever these functions may be. Sometime ago I came across a case in which the parathyroid was the seat of disease, and I have the sections of that case. My experience has been so limited that I have come to no conclusions, and I agree with Dr. Lewis that from the experiments that have been made there is no clinical evidence to show that there is a distinct relation between the thymus gland and the thyroid.

Dr. Charles A. Parker: As to the relation between the thymus and the thyroid, I do not possess any knowledge that has not been given out here to-night. The first attempt at taking out the thymus in an adult was made by Garré in 1910. He removed the thymus first from an adult in June, 1910, instead of operating upon the goiter in a case of exophthalmos. He claimed the blood-picture was changed, and the blood became normal, but in the course of six months the blood-picture changed again and it was necessary to operate upon the thyroid. So far as I know, that was the first adult thymectomy. There have been a number of these operations performed since.

I wish to say a few words in regard to thymectomy itself. The operation is done through a median line incision from five to six centimeters long, the lower part extending below the upper margin of the sternum, so that this upper margin is exposed and is a definite landmark in the field, then spreading the muscles and fascia down to the pretracheal tissues. I did this operation several times on the cadaver, in order to make myself familiar with the technique, and it came out quite the same in the living subject as in the cadaver; in fact, much better, because I saw two little processes of fat about half the size of my little finger, about four millimeters in diameter, coming up and going down regularly with the respiration. There were yellow masses of fat looking like omentum within a hernial sac or within the peritoneum. This was opened and in catching hold of the fat it herniated through just as nicely as omentum herniates through a laparotomy wound. It was a movement that you can get only in the living subject because after death the tissues are hardened; they are not so easily moved and you cannot remove the thymus without tearing it apart.

In the case I mentioned I had the pathologist go over it afterward, and he reported that it was thymus gland. It weighed about nine grams. Those who have had to do with the ligation of vessels know that it does not make much difference whether you ligate or do not ligate when the vessels are fine and the gland tears easily.

Another method of operating has been through a transverse incision. The first operation by the Mayos was done through a transverse incision two or three years ago. Any incision can be used, but I think the upper margin of the sternum is the safest landmark because that is bony and you can go in back of it, and, without any further cutting, simply separate the tissues. In the *Archives of Diseases of Children* I have published the different stages of the operation.

In regard to pressure of the thymus, the first case was operated by Rehn in 1896, and in that case he put in an intubation tube and relieved the obstruction. Whenever the tube was taken out the obstruction would recur. When the tube was reinserted the obstruction was relieved, but the removal of the thymus relieved the obstruction permanently. He did what was called exothymopexy; that is, he partially removed the thymus, opened the capsule, and brought it up in the neck. He was afraid to remove the whole gland. In the case of this little child, it was demonstrated by percussion by Dr. Joseph Miller some years ago, over a year after the operation, that the child had a thymus of the normal size of a child for his age, yet it was very evident that quite a complete thymus was removed, but not all of it. We have no slides of the thymus removed, but I think the report of the pathologist can be relied on, which is to the effect that it is a definite thymus.

In this country Chevalier Jackson, of Pittsburgh, first demonstrated by the bronchoscope that there was pressure upon the trachea, and I think he did at first an intubation. He was the first man in this country to remove the thy-

mus gland. The patient contracted diphtheria but lived. The operation was done by him in 1907. Several others have done it since, and the mortality, out of fifty cases I collected a year ago, was seventeen, none dying during the operation or within possibly a day or two after operation. Then came various deaths from infection and from some mistake in diagnosis in which there were broken-down tracheobronchial glands. These would have to be properly analyzed to see whether the operation was serious or not. The practical operative effort of removing the thymus is much simpler and easier than removing the thyroid.

DR. HARRY JACKSON: We have been taught that the thymus gland begins to atrophy at two years of age, and that at the age of puberty merely a rest of the thymus remains. In some cases, however, the thymus is persistent and the lymph-glands of the body enlarge and a condition known as status thymolymphaticus results.

Within the past few years, certain experiments and clinical observations have shown that the thymus may become hyperplastic from the embryonic rest, and assume quite large proportions, the lymph-glands of the body remaining normal; this hypoplastic thymus may set up clinical symptoms of tachycardia and lymphocytosis in exophthalmic goiter cases and be responsible for the sudden death that occurs in this class of cases.

Aschoff has shown that the *hyperplastic* thymus differs from the *persistent* thymus, in that in the latter the normal relations of the cortex and medulla remain, while in the hyperplastic thymus, which forms from the embryonic rest, the thymus is made up almost entirely of medulla while the cortex is hardly present at all, and the corpuscles of Hassall have undergone marked fatty degeneration and atrophy. I have found hyperplastic thymus in two or three cases within the last year, and so I have come to look for it at autopsy in goiter cases, etc.

One case was a woman, 49 years, who suddenly became highly toxic and developed symptoms of hyperthyroidism; her thyroid was somewhat enlarged, she had tremor and tachycardia, and the lymphocyte count reached, two weeks before her death, 40 per cent of the total number of white cells and just before death the lymphocyte count reached 60 per cent. Death was quite sudden and at post-mortem examination I found that a hyperplastic thymus was present. [Exhibiting specimen.] This is not quite all of it, because we removed some for microscopic examination. It weighed about forty grams. The thyroid was slightly enlarged and showed mostly a colloid goiter and only beginning signs, microscopically, of an exophthalmic goiter. And so I was led to think because of the degree of change in the thymus and thyroid that the thymus in this case was primary.

Klose has commented on this relationship in exophthalmic goiter and suggests that the thymus is responsible for the lymphocytosis and tachycardia, the two symptoms which are often persistent after the excision of the thyroid gland in exophthalmic goiter operations; and Halsted [1] has recently shown that if these cases are submitted to the X-ray, the thymus region being the part exposed, that the lymphocyte count is rapidly reduced and also the tachycardia. Klose shows that the thymus is very rapidly reduced in size under X-ray treatment, so rapidly that he advises against its use in very young children. Halsted reports good results with the use of the X-ray in these cases after the removal of part of the thyroid gland.

I want to show another thymus which weighed sixty grams, from a young man of twenty, who had an enlarged hypophysis. I show this in order to emphasize the point which Dr. Lewis brought out, that we are dealing with a polyglandular syndrome and the thymus may be enlarged in disease of other glands than the thyroid.

Here is a case of which I have not been able to find many in the literature in which the thymus was greatly hyperplastic. The boy is twenty years of age, and died of symptoms of pressure from an enlarged hypophysis.

DR. FLOYD B. RILEY: I did not expect to be asked to say anything on this subject. I have been fortunate enough to see the thymus glands of about two hundred children at autopsy. I was not the pathologist who did the work for Dr. Parker, although I saw the specimen after he had removed the gland. The weight was about nine grams.

In two cases operated on by Dr. Buford at the Children's Memorial Hospital, there is special interest in the fact that evidences of thymic asthma were well marked and also in the fact that quite a distinct shadowgraph was shown in each and the weights of the two glands were comparatively small. We have the glands in the museum and they do not impress you at all as enlarged thymus glands. The weight of one of the glands was five grams; the weight of the other was seven. Neither of the children was over two years of age. The color of these glands as they came out at operation was as a rule a little deeper than a light pink, and that is all I have been able to see in the two cases at operation. Histological preparations revealed nothing different than the usual thymus sections.

Another interesting feature in the whole thymus subject is the very great difference of opinion

[1] Bull. Johns Hopkins Hosp.

as to what is the normal maximum weight of the thymus gland. One authority gives the maximum weight of an enlarged thymus gland as thirty grams; another gives it as sixteen, and another considers seven grams as quite normal; these figures being for children up to the age of two. The largest we have seen in any child at autopsy weighed sixteen grams. It was in a case of clear-cut so-called "thymic" death, and an interesting feature in this particular case was the fact that marked pressure upon the large veins at the base of the heart and the lungs had been made by an enlarged gland. This pressure had resulted in marked cyanosis of the lungs and subpleural and subperitoneal tissues, which is strong support for the idea that a great deal of the trouble due to this gland may be the result of pressure upon the vessels at the base of the heart and hilum of the lungs. There are other authorities who believe that "status lymphaticus" is a toxic affair. But we have another interesting case which would seem to me to align the thymus gland more with the lymphoid tissues of the body than with the thyroid gland. It was a case of streptococcic cellutis of the neck in which there was brawny induration of all the tissues of the neck with rapid extension downward through the glands of the mediastinum involving the thymus gland as well and the lymph-glands in the abdomen—retroperitoneal and mesenteric. The tracheobronchial lymph-glands were markedly enlarged; there was an enlarged gland pressing upon the common bile-duct and in consequence an enlarged and tense gall-bladder, and I particularly noticed the thyroid gland in this case to see if it also had become involved in this rapidly spreading infection. The thyroid gland was no larger than that usually observed in a child of this age, two and one-half years. The infected thymus gland weighed sixteen grams.

In conclusion, it would seem to me that Dr. Lewis is right in saying that we do not really know what relation, if any, the thymus bears to the thyroid. Our actual knowledge of the physiology and pathology of this gland is as yet not definite enough to be of final value.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN SURGERY

By MAJOR G. SEELIG, M.D., Saint Louis, Missouri

THERE has been much speculation in the public press regarding the economic effects of the European war. Of course Europe will, of necessity, require quantities of the great American staple—cotton; and since to-day, just as in the Napoleonic era, armies still "travel on their bellies," we shall be looked to as the great visible source of supply for corn, wheat, and meat. A due and fitting sense of the amenities of life has brought it about that America and Americans are not flouting this fortunate reversal of the balance of trade. The possible increase of exports has almost been relegated as a side issue and attention has been riveted rather upon the diminishing imports. And, unless he stops to think, one hardly realizes how crippling this fall of imports is. In our own work, for instance, we shall have to content ourselves with the thought that American medical volumes and medical journals are fairly self-satisfying, even to the most critical reader. It is hardly to be hoped that the cut in our supply of foreign literature will, in any way, stimulate American productivity. With trade and commerce, it is a very different proposition, for here the goads of competition and necessity are two very important factors. In science, the quality of the product in a very large measure depends upon the inherent tendency of the individual to seek and to know—the "divine afflatus of the truth seeker."

The influence of Germany and her medical investigators has been most stimulating, not only to American workers, but to those of all other nationalities. Undoubtedly there will be a falling off, at least in the quantity, of German product, particularly if the war lasts for any length of time. We shall perforce, therefore, have to content ourselves with our own endeavors. As the matter stands, it is, of course, too early to indulge in prophecy.

It isn't fair at this early date to attempt to estimate the books for review on the basis of how they do or how they do not reflect the withdrawal of continental stimulus; but, nevertheless, all the books this month, with a single exception, are home products. One can hardly avoid the hope that medicine will not be as hard hit as commerce has been and that she will be as resourceful in compensating her losses.

WITH American medicine in mind as a central thought, the volume from the Mayo Clinic[1] has a special interest for us, in that it mirrors a distinctly new tendency. The book is a stout compilation of some eight hundred odd pages, devoted to papers written by twenty-eight different contributors, and covering various aspects of surgery: clinical, technical, pathological, röntgenological, chemical, and physiological. The papers are grouped under the subheads: Alimentary Canal, Urogenital Organs, Ductless Glands, Head, Trunk and Extremities, Technic, and General Papers. It goes without saying that scarcely any reviewer possesses the requisite temerity to attempt to set down, in print, crystallized judgment on an array of seventy-odd papers. He could not do so, within limited space, in fairness either to himself or to the authors; and in this particular instance, there need be no qualms of conscience about the matter, for all the papers have been published separately before, thus permitting almost every one to have reached his own mature conclusion even before the book fell under the eye of the reviewer.

But we can do better than furnish the always more or less insignificant expression of personal opinion, by pointing out the message delivered by the book—a message which we have characterized above as a tendency, and which the knowing ones in America are already beginning to recognize as something to be threshed out most carefully, in its relations both to the practical and the educational phases of medicine. We refer to what for a better phrase we may call coöperative medicine; that is, the adjustment, coördination, and direction of multiple individual efforts toward the central fusion point of practical or scientific efficiency. That is what the Mayo Clinic stands for, and nothing could express the stand more clearly—or, indeed, more excellently—than does the volume in hand.

Whether such coöperative plans could be carried through by others than those rare types of individuals, gifted with exceptional executive capacity, knowledge of men and driving force; whether such plans of coöperation do not foster rather a bulk of work than the fundamental idea of a broad comprehensive personal grasp of the phenomena

[1]Collected Papers by the Staff of St. Mary's Hospital, Mayo Clinic (1913). Philadelphia and London: W. B. Saunders Company, 1914.

of disease; and whether they do or do not in a measure violate the important idea of freedom of effort — freedom of effort, we mean, in the university sense,— all these are problems no less settled than they are interesting. And from the point of view that these very problems are raised by the work of a group of American investigators, we have further evidence that there is much at home to busy ourselves with, even if our foreign stimulus be entirely cut off.

IF any one who knew the activities and tendencies of Dr. Mumford were asked to state what kind of a volume on surgical practice he would turn out, the answer would probably be, "A book characterized by charm of style and a novel point of view." Such a prophecy is well borne out by the volume before us.[1] The book is the expression of many years of practical work, both as a surgeon and as a teacher, and is therefore admirably personal in tone, ringing a clear didactic note throughout. And yet, in spite of its didactic character, the material is so presented as to make an equally strong appeal both to the practitioner and to the student. Mumford realized at the outset that it was a fairly impossible task to present adequately, in a single volume, the usual amount of material that is crowded into a book, under the title of "Principles and Practice of Surgery"; he has, therefore, omitted the usual formal discussion of the principles of surgery, except where such a discussion seemed to him to be very necessary. In reaching this decision he was, we believe, moved by the wisest counsel. He left the beaten path, he strayed farther afield, and planned his work so that he might describe surgical diseases in the order of their surgical interest, importance, and frequency.

The result of his plan is a volume of a thousand pages divided into seven parts, devoted to the abdomen, female generative organs, genito-urinary organs, the chest, the face and neck, the head and spine, minor surgery, and diseases of structure. Each of these various parts is divided into chapter heads, under which the different diseases are taken up in order. The striking value of Mumford's discussion of disease centers in his lively and yet bell-clear expository style. And we mention this particularly because, in this review, we are more or less centering on those American characteristics on which we may be forced to depend during the lean months of diminished supply from abroad. English medical men undeniably practice a grace and clarity of style that contrasts rather sharply with our own deficiencies in this direction. Mumford points the way to better things and less invidious comparisons. What minor deficiencies there are in the book are more than compensated for by the general make-up of the volume, which may be characterized as adequate, stimulating, and refreshing—a worthy American product.

[1] THE PRACTICE OF SURGERY. By James Gregory Mumford, M. D. Second edition. Philadelphia and London: W. B. Saunders Company, 1914.

ANYTHING from the pen of Dr. John B. Murphy is usually and properly regarded as a type of the best American product. Unfortunately, however, one feels himself forced to begin his critique of Murphy's last two volumes of "The Clinics"[2] with the famous introductory words used by Lord Jeffrey in reviewing an early volume of Wordsworth's poems; namely, "This will never do." It will never do for Dr. Murphy to allow his publishers to advertise: "Why, in the April and June numbers you get a sure means of differentiating appendicitis, cholecystitis, and ascending urinary infection." Dr. Murphy certainly knows that there is no *sure means* of making such a differentiation. It will never do to illustrate the fact that a wheel is made up of rim, spokes, hub and felly by a rather pretentious full-page drawing showing a dismantled wheel. It will never do to refer to "the fat-splitting action of trypsin" (April Clinic, p. 256), or to describe an abdominal pain by locating it between Albany and Troy (June Clinic, p. 441). It will never do for Dr. Murphy to head a most excellent talk on "Surgical Diagnosis" by a description, in small print, of how a medical student interlocutor shouts, "What's the matter with Murphy?" and how the class reverberates, "He's all right!" Of course, all this—that is, all except the ill-advised advertising—is merely evidence of bad editing and is, therefore, an easily corrected fault.

The more difficult problem confronting Dr. Murphy, as we have mentioned before, consists in varying his subject matter so that the interest of his readers will not flag. For instance, in the two volumes of the Clinics under review, the subject matter is almost identical with that which has been presented before, and in some instances, more than once before. This criticism, of course, does not militate against the essential excellencies of these individual volumes. They mirror very clearly Dr. Murphy's usual brilliance and enthusiasm. But even those of us who realize the impossibility of diversifying the presentation of clinical material month after month look for variety, despite ourselves. It is necessary at this point to make special mention of the admirable discussion of ankylosis of the jaw, in the June Clinic, with a full description of Murphy's operation of arthroplasty, illustrated with excellent drawings by Tom Jones.

THIS little volume by Neef[3] is typically American—concise, concrete, and unqualifiedly practical. There are, in all, fourteen chapters devoted to the general preparation of the patient, the surgeon's hands, the field of operation, the utensils and instruments used, wound healing, aseptic suture material, anæsthesia, incisions, the course of operation, the after-care, and treatment of unclean wounds. The value of the monograph is enhanced

[2] THE CLINICS OF JOHN B. MURPHY, M. D., April and June, 1914. Philadelphia and London: W. B. Saunders Company.

[3] GUIDING PRINCIPLES IN SURGICAL PRACTICE. By Frederick Emil Neef. New York: Surgery Publishing Company, 1914.

by the facts both that it expresses so clearly the individual viewpoint of the author, and yet furnishes, when possible, a scientific basis for the various personal preferences. This is admirably illustrated by Neef's discussion of his method of preparing the field of operation and also by the few pages that he devotes to the subject of wound healing.

We have always objected to marginal notes in red ink as adding very little save flamboyancy to a volume; but in this little book the marginal notes serve a useful purpose and do not seem to be noticeably obtrusive.

THIS volume by Ely[1] suffers by contrast with that incomparable book on "Joint Tuberculosis" published by him in 1911. In the earlier volume, Ely had an imperative message to deliver, and he fulfilled the task most adequately, thus verifying our statement, just made, that a high quality of product is proportioned to the individual enthusiasm to seek and know. In this volume, now under review, there is no strikingly personal note, and there is much to warrant the misgivings which Ely himself frankly admits in his preface. On the other hand, Ely is clearly conscious of the fact that he has only skimmed the surface, and gives as his reason for so doing his desire to present to the general practitioner, in small compass, general principles that are evolving from modern clinical and laboratory investigation.

The first chapter gives a terse summary of the rational basis, anatomical, physiological, and pathological, of bone and joint disease. This chapter is short, but its value can only be estimated in terms of the number of general practitioners who read it and the discrimination with which they read. Eight other chapters are devoted to acute and chronic arthritis, ankylosis, acute and chronic osteomyelitis, and the new-growths of bone.

THE monograph by Sorrel[2] is the only foreign volume of the month. As one reads the book, however, one almost forgets its Gallic origin in noting the hearty accord with the theory and doctrine of the Englishman, Lane, regarding intestinal stasis. Some of us subscribe to the theories of Lane and some of us are more prone to agree with Sir James Goodhart's quaint dictum that, "What is a kink to us is not necessarily a kink to the intestine"; but, at all events, full credit must be accorded Sorrel for having presented the entire subject of intestinal stasis *secundum artem*.

In two introductory chapters, the author covers the history of the subject and the embryology of the large intestine. The two succeeding chapters discuss the anatomy and physiology of the cæcum, appendix, and large intestine. The positon of the appendix, mobility of the cæcum, rotation and descent of the bowel, anomalies of the sigmoid, pericolic membranes and ligamentous fixations are presented in detail, and well illustrated in the chapter devoted to anatomy. The chapter on physiology furnishes a particularly lucid account of peristalsis and antiperistalsis, with an excellently selective set of bibliographic references. The etiology, pathologic anatomy, symptomatology, diagnosis, and treatment of intestinal stasis are elaborated under separate chapter heads, the volume closing with a terse set of conclusions, a full set of case histories, and an extensive bibliography covering twenty-odd pages. Under the head of pathology, Sorrel shows that in addition to the ordinary type of stasis, due to ptosis, atony and megalocolon, there are other types, due to purely local conditions, such as Lane's kink, mobile cæcum, pericolic membranes, splenic flexure fixation and angulation, and obstruction of the sigmoid.

An outline, even as sketchy as the one we furnish, is really all that is necessary as a guide for those who are interested in the subject. A book review is not an appropriate place to enter the lists with tilted lance on a subject as problematic as is the broad question of intestinal stasis. And yet one cannot lay the volume down without a comment to the effect that the book by Sorrel confirms the opinion born of reading the work of most other investigators in this field; namely, that when it comes to religion and intestinal stasis, every man has his bias.

If we only knew what the phrase "chronic intestinal stasis," as used by Lane and Sorrel, really connotes! Certainly Sorrel nowhere in his volume furnishes us with this information. He argues rather naïvely when he says: "The theory of Lane, which seemed singularly bold at first, is now concurred in by many surgeons of high repute, behind whose authority I intrench myself. Moreover, recent anatomical studies lend strength to the probability of the correctness of the theory. If one admits that the theory is correct, then one must admit the relationship existing between chronic stasis and *accidents toxi-infectieux*" (p. 121). Both Lane and Sorrel fail to work out a satisfactorily specific symptom-complex characteristic of intestinal stasis, and certainly the therapeutic procedures aimed at correcting the so-called stasis have not always been satisfactorily corrective. And that is not all, more's the pity. Many of us do not know, and many of us who do know forget, that in an abortive dynamic attempt to overcome stasis surgically, we often convert a compromised individual into an actually invalided member of society. Furthermore, see how easily, after all, one drifts into the lists, even when one has deliberately set about to be a neutral onlooker.

[1] Diseases of Bones and Joints. By Leonard W. Ely, M. D. New York: Surgery Publishing Company, 1914.

[2] La Stase Intestinale Chronique. Par E. Sorrel. Paris: G. Steinheil, 1914.

AN APPEAL FOR AID FOR BELGIAN PHYSICIANS AND SURGEONS

A recent letter to a number of surgeons of the United States written by Sir Rickman Godlee of London, chairman of a committee organized in Great Britain in aid of their Belgian colleagues, in which Sir Rickman appeals to the profession of the United States for aid in relieving the distress in Belgium, has resulted in the organization of an American committee which will volunteer to accept subscriptions in money and surgical or pharmaceutical supplies, and distribute the same, to the best of their ability, among the Belgian sufferers.

The following stories, one by Professor C. Jacobs, of the University of Brussels, the other by Sir Gilbert Parker in a recent letter to the *Chicago Tribune*, explain in a vivid way the needs of the Belgians:

THE POSITION OF BELGIAN DOCTORS AND PHARMACISTS

By Professor C. Jacobs, University of Brussels

Belgium, a blood-stained and ruined country in the horrors of despair, claims the help of her friends to whom her freely consented sacrifice has brought a ray of hope in the dreadful nightmare of the past three and a half months.

I raise my voice with a feeling of intense pity on behalf of thousands of our weeping brethren in their Calvary of suffering, but it is my pride to carry out this duty to my country. All the evils of war have been thrust upon us at the same time — a useless and cruel holocaust of human lives, a decimated, despairing, and starving population, ruined homes, and, far worse than all, our children — the only hope of our country — are being mown down by want and disease.

Our doctors have not been spared; they, too, are bearing a heavy share of the general suffering. And now long weeks—nay, months—of trial stand before them, during which they know that they will have to bear a terrible burden. They will have to devote themselves untiringly, giving all their care and time, and even their lives, if need be, to the cause of their country; and yet many of them are homeless, deprived of their laboratories, instruments, and their medical stores. What will become of those that still remain of our people, threatened as they are by the grim havoc of war and by contagious disease, its constant follower?

In anticipation of these inevitable consequences it has become my duty, as the spokesman of my Belgian colleagues, to appeal to the medical and pharmaceutical world that an impulse of international fraternity may come to the aid of Belgian doctors and pharmacists. Is it realized that we in Belgium have suffered and are suffering? Duty, and duty only, has bound our doctors and pharmacists to their posts in the devastated localities; some of them are carrying on their profession in the ruined remains of destroyed buildings, whereas others have to improvise at haphazard any kind of shelter for their Samaritan work. Need I describe the manner in which they sustain themselves, and how they manage to nourish their wives and children?

I have witnessed such misery amongst them! Some have had to work as navvies in order to have a few pence in their pockets; others have told me that they had not seen bread for a fortnight, but had lived exclusively on potatoes. Others had a meager bunch of straw laid on the bare ground as a bedstead; the only pair of boots owned by one of them was falling to pieces in tatters. Men I have seen were dressed in torn garments and their children were in rags. One of my colleagues had to live on wayside herbs for three days and three nights, and his wife shared his fate! A professor of a university, bereft of everything, was, when I saw him, in dire want of a bed, and another of equal academic standard was wandering haggard over the countryside, searching in vain for a beloved family. And some of our ranks have been taken as hostages, others have been shot, and their widows and orphans have been left deprived of everything.

This description presents a genuine picture of the distress of the Belgian medical profession, but when these educated people are struck down by want they will never beg for charity; it must be brought to them. It is impossible to calculate how many of them are in this sore distress, and some have been so for days and weeks, but it is easy to see that the distress must be very widespread. Considering now the medical men only, Belgium contained 4,800 doctors; the number of localities that have been destroyed is roughly as follows:

Province of Brabant.— Londerzeel, Merchtem, Capelle-au-bois, Kotselaar, Wildouck, Cortenberg, Gelroode, Nienwenrode, Wavre, Eppeghem, Beyghem, Ottignies, Mousty, Louvain, Jodoigne, Linsemaux.

Province of Limbourg.— Haelen, Lanacken, Tongres (partly).

Province of Liége.— Liége (partly), Mouland, Bermont, Visé, Micheroux, Batisse, Herve, Hermee, Milmont, Flemalle, Francarchamps, Lincent, Huy, Seilles.

Province of Namur.— Namur (partly), Bierwart, Narille, Tamines, Faliseulle, Andenne, Spontin, Evrehailles, Houx, Yvoir, Dinant, Bovinure, Anhage, Hartière, Sommière, Walcourt, Mariembourg, Dourbes.

Province of Hainaut.— Charleroi (partly), Montignies, Morlanwelz, Gouy-les-Piéton, Lobbes, Beaumont, Frameries (partly), Merbes, Jemappes, Quaregnon, Marchienne.

Province of Luxembourg.— Rossignol, Etalle, Ethe, Florenville, Virtey, Arlon, Neuichateau, St. Hubert, Anthee.

The deserted province of Antwerp and both the provinces of Flanders have been battlefields since one month, with the great struggle raging round Dixmude, Nieuport, Courtrai, Middelkerke, Ostende. What remains of those places today?

Each of those localities has its doctors and pharmacists, and at least 1,000 of the doctors are now absolutely poverty-stricken, and 2,000 to 3,500 doctors are suffering cruelly through this war. We had 1,800 pharmacists all over the country, and at least 300 of them are unable to earn their living, and all of them, with very few exceptions, are deprived of the most necessary trading stock. I dare say that my estimate is below reality.

Consider the immense suffering that our medical brethren have gone through and are still going through. Their pathetic and lamentable distress should unite all in the desire to relieve it. These practitioners have given a lesson to the world of unfaltering energy, but now their

breaking courage will have to be kept up. In this emergency I call on the medical profession to rally to our help. It will be for us a great debt of honor and of eternal gratitude.

Sir Gilbert Parker, who visited the frontier towns of Belgium, and the camps of the refugees for the purpose of making a personal investigation, writes:

Whoever or whatever country is to blame for this war, Belgium is innocent. Her hands are free from stain. She has kept the faith. She saw it with the eyes of duty and honor. Her government is carried on in another land. Her king is in the trenches. Her army is decimated, but the last decimals fight on.

Many cities and towns have been destroyed; others, reduced or shattered, struggle in vain to feed their poor and broken populations. Stones and crosses mark the places where small communities lived their peaceful lives before the invasion. The Belgian people now live in the abyss of want and woe.

All this I knew in England, but knew it from the reports of others. I did not, could not know what the destitution, the desolation of Belgium was, what were the imperative needs of this people, until I got to Holland and to the borders of Belgian territory.

There at Maastricht I saw fugitives crossing the frontier into Holland with all their worldly goods upon their shoulders or in their hands, or with nothing at all, seeking hospitality of a little land which itself feels, though it is neutral, the painful stress and cost of the war.

I begin to understand what the sufferings and needs of Belgium are. They are such that the horror of it all almost paralyzes expression. I met at Maastricht Belgians, representatives of municipalities, who said they had food for only a fortnight longer. And what was the food they had? No meat, no vegetables, but only one-third of a soldier's rations of bread for each person each day. At Liége as I write there is food for only three days.

In Belgium itself the misery of the populace is greater than the misery of the Belgian fugitives in other countries, such as Holland, where there have come since the fall of Liége 1,500,000 fugitives. To gauge what that misery in Belgium is, think of what even the fugitives suffer. I have seen in a room without fire, the walls damp, the floor without covering, not even straw, nine women and eight children, one on an improvised bed seriously ill. Their homes in Belgium were leveled with the ground.

Of all the great powers of the world the United States is the only one not at war or in peril of war. Of all the foremost nations of the world the United States is the only one that can save Belgium from starvation if she will. She was the only nation that Germany would allow a foothold for humanity's sake in Belgium.

No such opportunity was ever given to a people; no such test ever came to a Christian people in all the records of time. Will the American nation rise to the chance given to it to prove that its civilization is a real thing and that its acts measure up with its inherent and professed Christianity?

The price of one good meal for a family in an American home will keep a Belgian alive for a fortnight.

Probably the United States has 18,000,000 homes. How many of them will deny themselves a meal for martyred Belgium? The mass of the American people do not need to deny themselves anything to give to Belgium.

The whole standard of living on the American continent, in the United States and Canada, is so much higher than the European standard that if they lowered the scale by one-tenth just for one six months, the Belgian problem would be solved.

This is the story of the condition of our profession in Belgium. It must appeal to the generous instincts of every medical man in our favored country. The medical men whose names are given below have consented to act as a committee, and will volunteer to see that all contributions of whatever kind that may be given to relieve the distress of the medical men of Belgium are promptly and economically distributed where they will do the most good. Dr. Frank F. Simpson, who has consented to act as treasurer of the committee, will place himself in touch with relief committees already organized and act in conjunction with them, or if necessary, will act independently if better results can be accomplished in that way. Money contributed will be converted into supplies, as cash, obviously, can be of little value in the devastated country.

The London Committee, consisting of Sir Rickman J. Godlee, Bart. (chairman); Sir Thomas Barlow, Bart., president of the Royal College of Physicians of London; Sir W. Watson Cheyne, Bart., president of the Royal College of Surgeons of England; Dr. Meredith Townsend, master of the Apothecaries' Society; W. J. Woolcock, secretary and registrar of the Pharmaceutical Society; Dr. H. A. Des Voeux (honorary treasurer); Dr. Dawson Williams, editor of the *British Medical Journal;* Dr. S. Squire Sprigge (honorary secretary), editor of the *Lancet*, makes the following suggestions:

The committee has made all preliminary inquiries, and has come to the conclusion that the most practical step which it can take at once is the dispatch to Belgium in portable form of packets of medical and pharmaceutical material. These packets will be made up by Messrs. Burroughs, Wellcome & Co. in accordance with an approved list, and will be conveyed to Belgium upon advice received from the American ambassador and Mr. L. Hoover, the Belgian minister, the manager of Messrs. Harrods, Limited, and Major Gordon, who has already done such good work as a medium for practical assistance between this country and Belgium.

The committee has already received promises of a certain number of subscriptions which justify it in making an experimental consignment, but it appeals to the medical and pharmaceutical professions in this country for funds to enable the Belgian medical practitioners and pharmacists to carry on their work effectually so soon as military and political circumstances permit.

We appeal also for surgical instruments; many of these, though not of the latest patterns, will be extremely valuable. The following are especially required: Scissors, dressing and artery forceps, scalpels, syringes, and midwifery forceps. The instruments should be sent at once to the master of the Apothecaries' Society, Apothecaries'

Hall, Blackfriars, London, E. C., and any small adjustments required in them will be made.

The intention is that the work of the committee shall develop, as the conditions in Belgium permit, and that the work shall be associated with corresponding efforts in Great Britain and Ireland, in the United States and other countries which are neutrals or allies in the war.

The American committee will undoubtedly operate through the relief committees of this country that are now specially operating in Belgium, and will have its packages prepared by instrument dealers and pharmaceutical houses of the United States and shipped directly to their destination.

The committee of physicians who have consented to act as sponsors for these contributions is as follows:

WILLIAM L. RODMAN, president-elect of the American Medical Association.

JOHN B. MURPHY, president of the Clinical Congress of Surgeons of North America.

CHARLES H. MAYO, president-elect of the Clinical Congress of Surgeons of North America.

J. M. T. FINNEY, president of the American College of Surgeons.

J. RIDDLE GOFFE, president of Seventh International Congress of Obstetrics and Gynecology.

GEORGE H. SIMMONS, editor of the *Journal of the American Medical Association.*

THOMAS L. STEDMAN, editor of the *Medical Record.*

E. W. TAYLOR, editor of the *Boston Medical and Surgical Journal.*

FRANKLIN H. MARTIN, editor of SURGERY, GYNECOLOGY AND OBSTETRICS.

HOWARD CANNING TAYLOR, New York.

FRANK F. SIMPSON, Pittsburgh (treasurer).

Contributions can be sent directly to Dr. Frank F. Simpson. 7048 Jenkins Arcade Building, Pittsburgh, Pa., or to the Belgian Physicians' Relief Fund, in care of the editors of the following journals: *Journal of the American Medical Association, Medical Record, Boston Medical and Surgical Journal,* SURGERY, GYNECOLOGY AND OBSTETRICS.

AMERICAN COLLEGE OF SURGEONS

THE THIRD CONVOCATION

THE third convocation of the American College of Surgeons was held in the Memorial Continental Hall in Washington on November sixteenth at eight o'clock. The program for the evening was as follows:

7:30—Fellows and Guests assemble.
7:40—Governors assemble.
7:45—Candidates for Fellowship assemble.
8:00—Regents assemble with Honorary Fellows and Guests.
Invocation by His Eminence James Cardinal Gibbons.
Introductory Remarks by the President, J. M. T. Finney.
Presentation of the Roll of Candidates for Fellowship.
Conferring of Fellowships by the President.
Introduction of Honorary Fellows individually by the Regents and conferring of Fellowships by the President.
Fellowship Address by Edward H. Bradford.
Concluding Remarks by the President.
Adjournment followed by an informal reception to the Fellows and Guests by the Officers of the College.

The President, Dr. J. M. T. Finney, in the course of his introductory remarks, announced that subscriptions to the endowment fund of one million dollars, which proposition has been presented to the College at its annual meeting, now amounted to approximately $250,000. He predicted that the full sum would be easily secured before the next annual meeting in 1915.

The Secretary, Dr. Franklin H. Martin, before presenting the roll of candidates, conveyed to the Fellows of the College a greeting from Sir Rickman Godlee, President of the Royal College of Surgeons of England, who came from England at the time of the first convocation to assist in the inauguration of the American College. This greeting included the presentation of a handsome gavel which had been prepared by Sir Rickman Godlee as a gift to the College, and upon which the following sentiment was inscribed:

This mallet was devised and used by Lord Lister and is presented to the American College of Surgeons by Sir Rickman Godlee, then P.R.C.S. England, in memory of his visit to Chicago, November, 1913.

The President in receiving this token of friendship, spoke of the great honor that Sir Rickman Godlee had conferred upon the Americn College of Surgeons by his visit and his address of one year ago, and of his pleasure in receiving this beautiful gavel which linked us with the Royal College of Surgeons, with Sir Rickman Godlee and his illustrious uncle, Lord Lister, and ordered that the gavel be forever preserved in the archives of the American College.

The Secretary then presented the roll of Honorary Fellows and of Fellows. The list of Fellows numbered six hundred and forty-six. Their names will appear in the annual directory, which will be distributed to the Fellows.

The Honorary Fellows were then introduced in turn by members of the Board of Regents, as follows:

Dudley P. Allen of Cleveland, introduced by Harry M. Sherman; William C. Gorgas of Washington, introduced by Charles F. Stokes; Lewis Stephen Pilcher of Brooklyn, introduced by George E. Brewer; Sir Thomas George Roddick of Montreal, introduced by George E. Armstrong; J. William White of Philadelphia, introduced by Edward Martin.

The President then conferred the Honorary Fellowships.

Following the fellowship address (see p. 123) by Dr. Edward H. Bradford, Dean of Harvard University Medical School, there was an informal reception by the officers of the College to the Fellows and guests.

THE FIRST ANNUAL MEETING

The annual meeting held in the New Willard Hotel was called to order by the President, Dr. J. M. T. Finney, at 3 P. M.

DR. FINNEY: The first order of business is the appointment of a number of committees. These committees will please assemble here on the left of the platform as the names are called, organize, and be ready to make their reports before the close of the meeting.

Nominating Committee: Dr. James E. Moore of Minneapolis, Dr. Hubert A. Royster of Raleigh, Dr. Frank F. Simpson of Pittsburgh.

Committee on Classifications for the Board of Governors and Regents: Dr. Ap Morgan Vance of Louisville, Dr. J. C. McCoy of Paterson, Dr. James C. Wood of Cleveland.

Nominating Committee for the Board of Governors: Dr. Charles H. Peck of New York, Dr. Gilbert E. Seaman of Milwaukee, Dr. Donald A. Hingston of Montreal.

The next order of business is the report of the Committee on Examination. You know that we must now proceed on the examination basis as regards all candidates for fellowship whose applications were filed after November first of this year. We are all interested, of course, in the character of that examination. A great deal of thought and consideration have been given to it and I am going to ask Dr. Edward Martin of Philadelphia, the chairman of that committee, to report the results.

DR. MARTIN: Your committee begs to submit the following tentative scheme for admission to the American College of Surgeons: On and after November 1, 1914, the candidate for admission to the American College of Surgeons, in addition to fulfilling the conditions previously indicated, i.e., that he shall have been graduated from a medical school for not less than five years, and shall present evidence of personal probity and specialization in surgical lines, shall be required to lay before the Committee on Examination:

1. Evidence that applicant has served at least one year as a hospital interne and three years as assistant, or one year as first assistant to a surgeon of recognized ability and with an adequate hospital service. From those who were graduated before 1915 an equivalent surgical experience shall be acceptable, especial importance being attached to laboratory and research work.

2. Evidence that he has visited other surgical clinics and laboratories than those to which he has been officially appointed, giving the dates of such visits, the time spent, and a brief summary of the work witnessed or performed.

3. An abstract of at least fifty consecutive major operations which he has himself performed, this abstract to contain the name and address of the doctor or consultant referring the case; the preoperative diagnosis; the anæsthetic given, by whom, the quantity and the time of administration; the date of operation, and a brief description of it, with a note of the time required for its performance, calculated from the first incision to the beginning of the application of the dressing; the post-operative course, and a mention of complications, if such occurred; not only those conditions usually classed as such, but consecutive bleeding which calls for measures directed toward its control, hæmatoma of sufficient extent to require evacuation or drainage or suppuration, as slight even as a stitch abscess, are to be regarded as complications. The condition on discharge from the hospital with subsequent course of the case up to the date of application for membership, or as near this as is practicable. The applicant shall supplement his individual report of operations by a further abstract report of at least fifty cases in which he has acted as assistant.

4. All applicants for fellowship to the American College of Surgeons whose date of graduation is 1920 or later shall be graduates from medical schools which shall have demanded of its matriculates two years of collegiate training, or the equivalent, including biology, chemistry, and physics. If the candidate's school of graduation be not accredited by the American College of Surgeons, he shall be required to pass a technical examination.

5. Surgeons widely recognized by the profession as leaders of progress and exponents of finished technique, by a unanimous vote of the Board of Regents may be admitted to fellowship on recommendation of the Committee on Examination.

DR. FINNEY: You have heard the report of the Committee on Examination. I wish we had time to answer questions upon these various reports, but we have tried, as far as possible, to make them so plain and so distinct that they would require little explanation. If anybody has a doubt in his mind, I am going to allow a few moments, but a very few moments, for the answering of questions. If anybody really has a doubt in his mind and wants information, we will try to supply it if he will so indicate. (Pause; no questions asked.) I think when you shall have had time to read this report carefully that you will see that it requires little explanation. As there are no questions we will go on to the next order of business. The report of the Committee on Permanent Home. I will ask Dr. Charles F. Stokes of Philadelphia, the chairman of that committee, to make his report.

DR. STOKES: I have to report that it is the sense of the committee on a permanent site for the College that the city of Washington should be selected as the permanent home. We have not had time to definitely determine upon a site, but we have viewed one this afternoon not far from here which we look upon with favor. Thus far no definite action has been taken. (Applause.)

DR. FINNEY: There seems to be little doubt that the sentiment, the almost unanimous sentiment, of the Fellows of the College has been in favor of Washington. (Applause.) There was some difference of opinion in the beginning, but as time has gone on, it seems to have been lessened until at the present time there seems to be very little difference of opinion on that point. As the chairman has indicated, a number of possibilities have been considered. At the present time — you have just heard the chairman's report — it has not yet been determined just what form or just what exact location the permanent home will take.

The next order of business is miscellaneous business. I am going to call upon the chairman of the Committee on Revision of the Constitution and By-Laws, Dr. Frederic J. Cotton of Boston, to make his report.

DR. COTTON: The Board of Regents, on the

recommendation of this committee, has decided to present to you for adoption the by-laws as originally given and approved and as provisionally admitted, with two changes. The first change is the addition of the American Institute of Homeopathy to the list of the fifteen societies named in Article IV as number sixteen of this list. The second change is in Article VIII of the by-laws as to fees required, to read as follows:

FEES.— An initial fee of twenty-five dollars shall be required of each Fellow of the College on his election to Fellowship by the Board of Regents. A fee of five dollars, payable on the first day of January, shall be required each year thereafter for five years. A payment of fifty dollars upon election shall relieve the Fellow of further payments.

DR. FINNEY: Do you move that the constitution and by-laws be finally adopted with these changes?

DR. COTTON: Yes, I make such motion.

Motion seconded and carried.

DR. FINNEY: The next in order is the report of the Treasurer.

Dr. A. J. OCHSNER, Chicago: I wish to present the report of a certified public accountant, who has examined the books of the College. [A copy of this report will be sent to each Fellow.]

It was moved and seconded that the report be accepted. Motion carried.

DR. FINNEY: Now, are the committees ready to make their reports? First we will call for the report of the Committee on Classification of the Board of Regents.

ELECTION OF OFFICERS, REGENTS, AND GOVERNORS

DR. JAMES C. WOOD of Cleveland: Drawings were taken this morning to establish the terms of the members of the Board of Regents. Those whose terms expire in 1914 are:

Dr. George E. Armstrong of Montreal.
Dr. Frederic J. Cotton of Boston.
Dr. Edward Martin of Philadelphia.
Dr. John B. Murphy of Chicago.

Those whose terms expire in 1915 are:

Dr. Herbert A. Bruce of Toronto.
Dr. George W. Crile of Cleveland.
Dr. Charles H. Mayo of Rochester.
Dr. Harry M. Sherman of San Francisco.

Those whose terms expire in 1916 are:

Dr. Robert E. McKechnie of Vancouver.
Dr. William D. Haggard of Nashville.
Dr. George E. Brewer of New York.
Dr. Charles F. Stokes of Philadelphia.

These drawings were made in this way: Three groups of four each were made up and the names placed on cards. These cards were placed in a hat and then the drawings were made. The first group taken out were for the term expiring in 1914, the second for the term expiring in 1915, and the third for the term expiring in 1916. The drawings for the Board of Governors were made in exactly the same way. This list is a large one, and with your permission I will turn it over to the Committee on Nominations without reading.

It was moved and seconded that the report be accepted. Motion carried.

DR. FINNEY: We will now hear the report of the Committee on Nominations for Officers and Regents.

DR. JAMES E. MOORE of Minneapolis: The Committee on Nominations wish you to distinctly understand that we are not trying to establish a precedent, but we realize that we are still in the stage of organization, that our organization is not yet complete, that the present incumbents of the Board of Regents have still a thousand names not acted upon, so that there is a year's work still laid out for them. Naturally, it would be a bad precedent, but for the present we are pleased to offer you the nomination:

For President—Dr. J. M. T. Finney.
For First Vice-President—Dr. W. W. Chipman.
For Second Vice-President—Dr. Rudolph Matas.
For General Secretary—Dr. Franklin H. Martin.
For Treasurer—Dr. A. J. Ochsner.

According to lots cast this morning, the following members of the present Board of Regents retire:

Dr. George E. Armstrong of Montreal.
Dr. Frederic J. Cotton of Boston.
Dr. Edward Martin of Philadelphia.
Dr. John B. Murphy of Chicago.

Your committee respectfully renominates these gentlemen for the ensuing term.

It was moved and seconded that the secretary be instructed to cast a ballot for the nominations made. Motion carried.

DR. FINNEY: We will now have the report of the Committee on Nominations for Governors.

DR. CHARLES H. PECK, of New York: To replace the members of the Board of Governors who are retiring this year, the Committee on Nominations reports the following names:

Dr. Robert Abbe of New York
Dr. Amos W. Abbott of Minneapolis
Dr. E. Wyllys Andrews of Chicago
Dr. Edward W. Archibald of Montreal
Dr. Charles S. Bacon of Chicago
Dr. Samuel C. Baldwin of Salt Lake City
Dr. J. M. Baldy of Philadelphia
Dr. Willard Bartlett of St. Louis
Dr. Carl Beck of Chicago
Dr. E. H. Beckman of Rochester, Minnesota
Dr. Frederic A. Besley of Chicago
Dr. Arthur Dean Bevan of Chicago
Dr. J. F. Binnie of Kansas City
Dr. Dougal Bissell of New York
Dr. John Bapst Blake of Boston
Dr. R. J. Blanchard of Winnipeg
Dr. Joseph C. Bloodgood of Baltimore
Dr. Rupert Blue of Washington
Dr. Hermann J. Boldt of New York
Dr. John W. Boveé of Washington
Dr. George E. Brewer of New York

Dr. W. B. Brinsmade of Brooklyn
Dr. LeRoy Broun of New York
Dr. John Young Brown of St. Louis
Dr. Truman W. Brophy of Chicago
Dr. Herbert A. Bruce of Toronto
Dr. William Evans Bruner of Cleveland
Dr. Coleman Graves Buford of Chicago
Dr. Frank E. Bunts of Cleveland
Dr. James Burry of Chicago
Dr. Henry T. Byford of Chicago
Dr. Hugh Cabot of Boston
Dr. W. P. Carr of Washington
Dr. John G. Clark of Philadelphia
Dr. Clement Cleveland of New York
Dr. E. A. Codman of Boston
Dr. Robert C. Coffey of Portland, Oregon
Dr. Royal S. Copeland of New York
Dr. W. L. Cousins of Portland, Maine
Dr. George W. Crile of Cleveland
Dr. Walter G. Crump of New York
Dr. Thomas S. Cullen of Baltimore
Dr. E. P. Davis of Philadelphia
Dr. F. G. DuBose of Selma, Alabama
Dr. J. M. T. Finney of Baltimore
Dr. George Gellhorn of St. Louis
Dr. Burton Haseltine of Chicago
Dr. C. E. Sawyer of Marion, Ohio
Dr. George R. Southwick of Boston
Dr. DeWitt G. Wilcox of Boston

It was moved and seconded that the report be accepted. Motion carried.

DR. FINNEY: Next in order is the report of the General Secretary.

ADDRESS BY THE GENERAL SECRETARY

DR. FRANKLIN H. MARTIN of Chicago: This report will deal with three phases of the affairs of the College: the past, the present, and the future.

RETROSPECTION

Nothing in medical organization in the memory of any of us has fired the imagination of the whole profession of a continent as did the first serious announcement of the plans of the American College of Surgeons.

The reasons for this were, first, because of the perfectly obvious fact that such an organization, properly established, would have a transcendent influence on the future of the surgery of America; second, because of the definite radical declaration of principles forecast for the organization by the founders of the College; third, because of the personnel of the body of men who immediately, squarely, and unequivocally placed themselves behind the movement; fourth and paramount, because every surgeon of ambition, imagination, and enterprise forthwith desired to ally himself with such a movement.

The mechanical development of the enterprise, as recorded in the office of the Secretary, has been an inspiration to everyone connected with the work.

Three thousand applications from all parts of the continent had been dealt with before the first convocation held a year ago; three thousand letters of instruction were sent before these first papers were filed; three thousand other letters, acknowledging the receipt of applications, followed these. Fifteen thousand letters were sent to fifteen thousand men, given as references in the first three thousand applications, and an average of one letter in each of these fifteen thousand references was written explaining perfectly obvious instructions. Letters, sending in groups the lists of candidates with the references of each of the three thousand, were mailed to the State Committees on Credentials of forty-eight states of the United States and the several provinces of Canada.

At the same time lists of approved candidates were sent each week to each Regent for his inspection and acceptance, or recommendation for reconsideration. This work eventuated in approving over one thousand applications for the first convocation.

Next it was necessary, before the convocation, to notify each of the two thousand unsuccessful candidates that his application had not been finally passed upon, and as far as possible give him the reasons for postponement. Finally, each successful candidate was notified by at least two communications of his election, and requested to report at the convocation. Besides this, literally a score of letters a day were sent to anxious candidates, to anxious friends of anxious candidates, and personal letters elucidating instructions to committees and individuals.

This brings us up to November 13, 1913.

In the next six months, ending with the convocation in Philadelphia, as many more candidates were dealt with in the same way, and one thousand and fifty-five more Fellows were added to our list.

To-day, six months later, we are to admit six hundred and forty-six additional members to our fellowship, still leaving two thousand candidates whose applications have not been finally considered.

In all 126,646 letters and 889 telegrams have been sent from the Secretary's office, and innumerable local and long distance telephone calls have been sent and received.

I have summarized this mass of detail in order to illustrate the hold this movement of the College of Surgeons has upon the surgeons of America; and this has been further exemplified by the interest shown in its progress by the official boards, by the state committees, by the individual Fellows, by surgeons and medical practitioners who have cheerfully stood as sponsors, and by every secretary and employee in the executive office.

While much work has been accomplished, it must not be taken for granted that it has been done with a haste that argues for waste or inefficiency. At the beginning the problem of organization seemed so insurmountable to the disinterested observer, the forms of attack presented by the opponents of progress were so many, that it soon became apparent to the organizers that the greatest possible momentum must be developed by the organization

forces if the objectors, with their irrelevant or unimportant criticisms, were to be successfully silenced.

By pursuing with all our might our own business, we have found no opportunity to reply to our critics, and time alone must justify the wisdom of our course.

We can now boast of 2,700 members, a charter list which will be easily increased to three thousand when the applications now on file are carefully sifted. One Fellow of the American College of Surgeons to each 36,000 inhabitants of our continent will be none too many with which to begin our campaign.

We enter our administrative period with our finances solvent and a substantial bank account with which to start our work.

INTROSPECTION

Now that we have so successfully laid the foundation of our organization by so nearly completing our list of charter members and have formulated tentative plans for our future administration, what does it all mean to us? How many mistakes have we committed? As officials and committeemen who have had to deal with the inspection of credentials of all these men have we been broad, generous, and judicious in our decisions? Have we been reasonably successful in avoiding the sins born of provincialism, of complacency, of abuse of intrenched power, of social exclusiveness, of envy and jealousy, of selfishness, and of local prejudice?

In anxiously watching our College develop, at times I have been apprehensive that some of these unworthy things were creeping in. Careful investigation and more time for consideration have almost invariably proved my fears to be without foundation. Dr. Ochsner and myself being the only officials of the College who know the personnel of the committees on credentials of the states and provinces can heartily testify to the almost faultless work that has been accomplished. Mistakes have been made. The highest judicial courts of our nation make mistakes because they, like us, are human; but I believe that no group of men has ever worked with greater unselfishness, or with higher devotion to a cause, than have the Officers, the Regents, and the Credential Committeemen of this organization.

What now of the rank and file of our College? Are we to look upon this fellowship as we would look upon a membership in a social club or guild? Are we to be satisfied to treat it as another surgical society to which we are to pay dues and, in a spirit of self-satisfaction, now that we are in, stop working? Are we to treat it as an ornamental honor, wear its regalia, assume its titles, and, without an effort to make it an organization of character, allow it to become an object of ridicule? That surely does not represent the spirit of its founders. The College of Surgeons either is a protest against pretense, incompetency, selfishness, unpreparedness, lack of character, and dishonesty among men who are called surgeons, or it has no reason for existence.

Everyone of us has been asked to make a vow of loyalty to the organization: that vow means sacrifice. Our creed is broad enough to reach a vulnerable point in the armor of each one of us. Do we intend to keep our vows, or have we subscribed to them as a matter of form, believing that the application is to be made to our associates only?

We have emphasized one article of our creed by asking that a separate and distinct pledge be made to it. Fee-splitting, for which this special pledge is prepared, is the one evil of commercialism that can be eradicated most easily from this organization because of its barbaric crudity. The practice of commercial sins that require the subtlety and finesse born of breeding, education, and a knowledge of the world, will be the most difficult for us to stamp out.

"To pursue the practice of surgery with thorough self-restraint; . . . to place the welfare of our patients above all else; . . . to regard scrupulously the interests of our professional brethren and seek their counsel when in doubt of our own judgment; . . . as far as able to avoid the sins of selfishness; . . . to shun unwarranted publicity, dishonest money seeking, and commercialism; . . . to make our fees commensurate with the service rendered, and within the patient's rights; and to avoid discrediting our associates by taking unwarranted compensation. . . ."

These also are our pledges. These are the articles of the contract we have entered into between ourselves, and that we have published to the lay and professional world as our standards of action. There is no article of that contract that will not hit some one of us very hard; no one of us can escape them all. It is like a prayer—easy to utter, but difficult to live up to; but, like a prayer or any other ideal, if we succeed in placing ourselves in alliance with it, it will make for character, satisfaction, and advancement.

It will not do for a few idealists to adhere to the letter and the spirit of each article of the creed of the American College of Surgeons and allow the rank and file to ignore them. If the College is to be a real moral and educational force, it must enforce promptly and definitely its own declaration of principles among its Fellows; then its Fellows may hold up their heads and fearlessly do the work that it has laid out for them to do.

PROSPECTIVE

We have now reached in the history of our organization the stage of administration and development. We are about to put into execution a method of admitting the future Fellows to the College.

You have learned from the report of the committee just read to you that the test of eligibility to membership will not be along the lines of simply passing a quiz examination, but will consist of a plan that will bring to light the candidate's qualifications as a surgeon from the standpoint of fundamental edu-

cation, professional education, hospital advantages, a consideration of the number of years spent in the practice of surgery, with actual evidence submitted of the definite amount of work accomplished, and evidence as to the class of laboratory or hospital in which the work was performed.

The effect of these requirements, insisted upon by us, will be to place every future candidate on probation, and that probationary time will have to be spent in surgical work in institutions, whether private or public, that will furnish modern equipment in refined methods of diagnosis, care of patients, laboratories, and record-keeping that will be acceptable to our standards.

This places upon our shoulders an enormous responsibility, and a corresponding power. It makes us indirectly censors of the machinery of surgeon-making from the time the prospective surgeon as a student enters his literary course of study, through his professional school, his hospital interneship, his assistantship, and his early years of independent practice.

If our censorship is to be recognized, we will have to show that we are worthy of consideration, and that fellowship in our organization is so desirable that every one of these factors in the education of a surgeon will cheerfully coöperate with us.

And why shouldn't our influence be welcome? What our committee's plan contemplates, when worked out in detail, is the systematic development of a surgeon to the very highest efficiency.

But how futile are peace treaties submitted by a nation without power to enforce! How futile will be our proposals if we have not influence to make them desirable!

Our influence, obviously, must come from the layman upon whom the surgeon operates. He must be convinced that we stand for safe surgery; that we are against juggling of fees, unprepared operators, and inadequately equipped hospitals. After we have convinced him of these facts, the American College of Surgeons will have no difficulty in maintaining its influence with colleges, universities, hospital organizations, legislators, and the profession of medicine at large.

The crux of our problem now is: How are we going to carry out our comprehensive plans? It seems to me, first, we must obtain a group of men, each of whom is in sympathy with our whole problem, but each of whom is particularly interested in one phase of it, so much interested that he will be willing to give a certain definite amount of time to its consideration; second, we should place in charge of our entire educational campaign a trained educator who, under the advice of our Board of Regents, and in coöperation with the group of men referred to above, will, like the President of a university, devote his entire time to the administration of the College; third, this director of the College, with the group of surgeons coöperating with him in the capacity of a cabinet, would especially have charge of publicity matter that shall be distributed, and would constitute the Examining Board of the College.

To be more definite—we should secure four surgeons of peculiar adaptability, chosen for a definite term of service, and pledged to devote at least six weeks each year to the exclusive work of the College, and to coöperate with the executive officer and office. One of these four men should urge upon hospitals through their lay boards and medical staffs the necessity of meeting our requirements; one should be keenly interested in the problem of urging universities to comply with our standards; one, a trained laboratory man, should prepare a minimum requirement for the surgical laboratory work to which our Fellows must conform; one should critically look after the legislative measures in which surgeons should be interested. Such a strong combination as our administrative board, constantly working out our problems, would succeed in keeping all questions pertaining to the College well in hand, would keep in close touch with our candidates, and would enlighten, through the proper methods, the public and the profession as to our plans and our endeavors to improve the standard of surgery.

This plan, which seems to be the one suggested that meets the approval of the Board of Regents, has one serious drawback. That drawback is of a kind that often figures in the conduct of enterprises, viz., inadequate financial resources.

The legitimate income of the American College of Surgeons on its present basis is less than $15,000 a year. This will little more than pay the running expenses of a very modest executive office, and is far too meager to pay a salary to an executive head and per diems and traveling expenses to four competent professional men for six weeks' service each year.

We cannot afford to be parsimonious in the conduct of our executive affairs. We want the strongest educator, possessing executive ability, available for this position. When we find the man who will honor us on any occasion, or at any place in which his services may be required for the College, we must be prepared to offer a salary commensurate with his worth, and in accordance with the dignity of the position.

For some time we might drift along and obtain the services of public-spirited surgeons to act in the capacity of advisers to our executive, who would devote their time to our cause, who would attend meetings in New York, San Francisco, and Winnipeg, and who would pay their own expenses. If our association were a charitable or a religious organization, or a group of superannuated pedagogues, such a plan might seem proper.

We are not superannuated pedagogues, but we are three thousand active professional men at the zenith of our power, practicing one of the best paid branches of medicine. We have been selected from a group of thirty thousand specialists as preëminently to become the charter members of an organization,

which, if properly conducted, will become a power on this continent that will redound to the glory of its founders for many centuries. We have not been asked to take an examination. We are not at the beginning of a struggle for existence. We have been especially honored by the peers of our profession in a way that no other group of surgeons in our country can be honored. It is not an honor that has been welcomed by a few, but an honor that has been acceptable to the highest in our ranks, and an honor that will constantly grow as our organization continues.

In order to have our organization of the greatest possible value to mankind, and to have it endure without a possibility of a doubt, it is very desirable that we at once put it upon a financial basis that will make it possible to do its immediate work adequately and forever place it beyond pecuniary need.

At our informal mass meeting in June we submitted a proposition to a minority of our Fellows which called for the raising of an endowment fund from among the charter members of the College of one million dollars. It was proposed that this sum should be invested in perpetuity and only the interest be used for the executive work of the organization. Each Fellow was asked to subscribe five hundred dollars. It was understood that all subscriptions should be contingent on our raising five hundred thousand dollars by December 1st of this year, the first payment on the subscription to be made January 1, 1915.

One hundred and thirteen thousand dollars, or subscriptions from two hundred and twenty-six Fellows, were received, and it was the intention to push the plan among those Fellows who were absent from the mass meeting, after the summer vacations. The war decided the Regents to ask those who made subscriptions to give their mutual consent to extend the time for obtaining the subscription one year, or until December 1, 1915, and the beginning for the payment of the subscription to January 1, 1916.

Our subscription plan is a promise to pay in the form of a note-pledge, with a discretionary provision to pay in installments, the entire amount at one time, or to have the entire amount stand in the form of a promissory note, interest to be paid on all balances at the rate of five per cent per annum.

It is further stipulated that from this pledge shall be deducted the amount of the membership fee and annual dues that may have been paid at the time the pledge becomes effective.

The Board of Regents feels that this is a convenient time to give a large group of the Fellows an opportunity to sign this agreement. The blank forms of the pledges will be distributed now, and it is hoped that they will be filled in by all of those who have not already signed them.

Personally, I hope that everyone will look favorably upon this proposition. It has been well thought out by the Regents. There is no doubt that a prompt acquiescence in the judgment of the Regents in this matter on the part of the Fellows of the College will place the organization in a position of such strength that everyone will be proud of his alliance with it. It will place it not only in a position of strength, but it will make it the most independent medical organization, financially speaking, in existence, and its security of position will be such that it will in the future attract many substantial endowments that will build its home and add to its dignity.

The sum asked for of each one of us is extremely small compared to the results sought. The aggregate amount, however, of two thousand subscriptions of these small pledges will sum up to a magnificent total.

A year is given the Fellows in which to become accustomed to the sacrifice. If one does not want to give the cash at the beginning, a promise to pay will be quite as welcome. What is pledged in notes will not have to be invested. Remember! no one makes a better investment than when he invests in something that is the strongest thing of its kind.

If our organization, with its great ideals, with a desire to accomplish unusual things, is without the financial capacity to execute, it would have been better that it had never been conceived. On the other hand, if the enterprise for which we have worked so hard, and for which we have hoped so much, is to occupy a practical and enduring position, the result can be assured definitely, if in this first year of our administration each one of us will accept the judgment of our Regents and sign the endowment pledge.

DR. FINNEY: With this very comprehensive report of the Secretary there is really very little left to be said, but perhaps there are one or two points which might still be a little in doubt in your minds. The question is so often asked: What are you going to do with all that money? Now, Dr. Martin has tentatively answered that question. I say tentatively. The plans which he has suggested are those which have been and are at the present time promised in our motions. They are working bases, as it were, for the future. But in all probability those plans will have to be modified, and modified in certain directions which do not appear at the present time. But whether they are modified or not, whatever the substitute is, the whole plan is going to need—if it is carried through to its completion in the way in which we want it and in which it ought to be done—it is going to take money. I want to say one more word. Not one cent of the money pledged here is to be spent in bricks and mortar. We hope to be able to provide our home in some other way. The money of this endowment fund is going to be used in carrying out the ideals and the ideas for which the American College of Surgeons was founded. Now, get that idea fixed definitely in your minds. In order to carry out these ideals—the standardization of surgery, the elevation of surgical practice and all

that that implies—is going to take more money than we appreciate now. The more you go into this question the more there will be found yet to be done; and whatever is done must be done properly, must be done by men of the highest character, morally, ethically, intellectually. And we cannot command the services of those men without paying them adequate salaries. Just how big this organization will ultimately be, the services of just how many men of this character we will need, it is impossible to say now. But that we will need the services of a considerable number of men of this character we are convinced. That is going to take a large endowment, because we want to live respectably; that is, within our means. And our means must be adequate to begin with in order to do this. I am going to call upon Dr. Murphy to say a word to us in this connection.

ADDRESS BY DR. MURPHY

Dr. John B. Murphy: No return should be expected without an adequate investment, except counterfeit. If we are to expect from this organization the fulfillment of the ideals presented to you today, it must have an adequate moral and financial support. The members are expected, and I am sure desire, to each make a small individual sacrifice to sustain the work, and colossal sacrifices have already been made by men on this platform. There is one man on this platform today whose time, whose labor, and whose energy already expended for this organization, if priced by the average results which he obtains daily for his work in other fields, would represent over twenty thousand dollars, without one cent in return. I refer to Dr. Ochsner's work on the Committee on Credentials. [Applause.] There is another man whose labors on the same basis would represent practically an equal amount, as he has expended units of energy and time which could have been profitably disposed of for other purposes—I refer to the secretary of this organization, Dr. Franklin H. Martin. [Applause.] Many others whom I might mention have enthusiastically contributed their time and money to the same purpose. But it requires that type of spirit and that type of man to advance an ideal; and we were fortunate—I might say we were blessed—by having these men in at the birth of this magnificent organization.

Now, what do you expect in return for your investment in the endowment fund of this organization? I will not accept the term "donation." Such a word does not convey the correct idea and has not the correct significance in this case. It is an *investment*—it is an investment in your future, and an investment in the future of the surgery of this country. It is, above all, an investment in securing for the people who have confidence in us a higher grade of surgical service. That is the prime purpose of this investment: that we will assure and insure to the people a standard and character of service in the future that they have not enjoyed in the past. That is the highest ideal for which a surgeon can work. Will it be a burden on you? No! It cannot be a burden on a body of men, twenty-six hundred or three thousand strong, to each pay now five hundred dollars for the permanency of this organization.

What do you receive in return? What do you receive, Dr. Smith, and you, Dr. Brown?

First, a central organization with a trained educator at its head. He must be paid from five to ten thousand dollars a year. He should have been the president of a university that is in close touch with the medical department, and should know the desires and aims of the medical profession; and he should also be conversant with the routes and methods of distribution of education to the people. You cannot employ this man for twenty or twenty-five thousand dollars a year if he does not know that it is be to for a long period of time. He will not invest his nerve value in something that may perish in a year or two. It *must* be for a long time, or indefinitely, if he sustains himself in the position.

Second, in your home town you receive a report that your competitor is unethical, that he is securing his business through improper inducements. The story may or may not be true, but you report the matter to headquarters, and an investigation will be instituted to determine the facts, and the condition will be corrected in consonance with the requirements. In addition to this, a leaven is already being disseminated which is elevating the moral tone of the profession in its relations to its fellows and to the people.

Third, there will be a central bureau of information—in Washington, if you like—to which you may apply for aid in the management of each one of your cases that is causing you anxiety, for information as to the best line of literature on any individual topic, and for information as to the best place to attend clinics for instruction.

These and many other things you will receive daily, weekly, monthly, and annually for your investment of $500, or for your investment of $25, which is 5 per cent interest on $500. Could one expect greater returns from such a small investment? [Loud applause.]

Dr. Finney: Now, gentlemen, the cards have been distributed for your disposition. I trust you will all fill them in, as many of you who can, and I feel sure that most of you, perhaps all of you, can if you will. Just note the conditions mentioned on the card. This is not to be paid at once. It is to be paid at your convenience. Call it an investment, or a sacrifice, if you will, but remember for what cause the sacrifice is made. Anything and everything that is worth while requires a certain amount of sacrifice.

REMARKS BY FELLOWS

Dr. F. D. Gray, Jersey City, N. J.: I simply want to express my gratification at the clarification of one point which was made this afternoon by our

President in the statement which he made that not one cent of this endowment fund was to be spent for bricks and mortar. I think there has been quite a general feeling among the Fellows that the proposition made at our last convocation that we were to obtain a permanent home meant that we were to build an elaborate temple or clubhouse, or whatever you please to call it, and although I subscribed at that time, and am ready to renew the subscription now, that point has stuck in my mind. I felt that that was not a necessity for us, that it was not required, and I am glad to know that whatever comes from this endowment fund it is to be spent for work and work only. Aside from the fact that we must have suitable quarters in which to manage the work, I understand now that no elaborate administration building will come out of this endowment fund. If this appeal were generally responded to, if we were all to respond to it, you would have an endowment fund of a million and a half, Mr. President, as I figure it, and that would be all the better, because I, even in my feeble way, can foresee that in years to come you are not only going to need an income of fifty thousand dollars, but you will need perhaps an income of seventy-five thousand dollars, and your million and a half will secure it.

DR. FINNEY: I am glad, indeed, that that point has been cleared up. This money is to be expended in the brick of brains, and not in bricks and mortar. Are there any further remarks?

DR. JOHN WESLEY LONG, Greensboro, N. C.: I would like, in a few words, to sound the bugle note of enthusiasm from the rank and file of the Fellows of this College. The men who conceived and launched this organization must have had a magnificent conception of the necessities and the possibilities confronting the profession in America; and they surely had a vision with a wide horizon of the achievements that may be attained by organized effort. As I sat listening to the Secretary's report and the addresses by the gentlemen who have preceded me the question arose in my mind, What does this American College of Surgeons stand for, any way? Does it mean simply that we can throw out our chests and write "F.A.C.S." after our names? Is that the idea? Does it mean that we can meet once or twice a year at some aristocratic hotel in a great center and felicitate ourselves on being members of this exclusive organization? Hardly! I will tell you what it means. It means that that little half-baked surgeon down there in your country who has such a narrow conception of his privileges, of the mission of surgery, that he slips part of his fee back into the general practitioner's pocket—that fellow has got to be put out of business. It means that that medical journal lying upon your desk in your office now, containing questionable, unethical advertisements, must go into the waste basket and stay there! It means that the really great man, little fellow though he be, struggling with unfavorable environment, shall have you put the strong arm of this American College of Surgeons around him and say: "Here, brother, look up; come with us and we will do thee good." It means that the medical college that pays semi-annual dividends and takes it out of the microscopes and other laboratory supplies its students ought to have has got to close up and stay closed! The medical college that is working to cultivate brain and not capital, that is trying to build character and not great institutions per se, has got to have behind it the great force of this organization and made to feel that we will stand by it forever!

But let us take a little wider view of the situation. Look just to the South of us at our sister Republic, at the interminable struggle going on there, with all the misery and bloodshed and horror of internal strife. What chance has science for development there, Mr. Chairman? Then turn your eyes to the West, and look at China's untold millions that Napoleon said was a "sleeping giant." What chance has science even in the domain of a giant, if he be asleep? But, saddest of all, turn your eyes to the East, and see whole continents aflame with the lust for human blood! Men, women, and innocent children are being shot down in the shambles like beasts in the field! Thrones trembling, dynasties crumbling, disorder everywhere! What chance has science there? You say, "What significance has all that to us?" It signifies, brethren, that the West (meaning America) no longer looks to the East for light, but that the East is calling to the West for help! Do you not hear the Macedonian cry of heroic little Belgium to "send us bread for our children, or they die?" If to-day they call for bread, to-morrow they will call for the higher things of life. Upon us who live in this God-favored land, this country of "watchful waiting," there has been rolled a burden and a responsibility such as the world never saw. We are confronting conditions such as have never occurred before and can never be repeated.

Now, as an organization, as a scientific institution, it is incumbent upon us to keep the lamp of science burning upon this continent. We can do that in so many ways that I cannot take time to go into details.

I have no patience with the man connected with an institution of this kind whose horoscope does not extend further than his own personal aggrandizement, whose conception of his privileges does not include the welfare of his profession and an ever-increasing benefit to suffering humanity! If our vision be so narrow that we do not see the possibilities that lie before us, then we will not put into this movement that which is necessary to accomplish magnificent results.

Let me tell you a little story from Mrs. Wiggs' "Cabbage Patch." You remember when the bride of a few months comes to Mother Wiggs crying like her heart would break because of the ugliness, the stupidity, the utter impossibility of the man she had married; old Mother Wiggs puts her arms around her and says, "Daughter, my experience

has been that you get out of marriage just what you put into it." So I want to say to you, gentlemen, we are going to get out of this movement just what we put into it; and, as in marriage, our posterity will get out of it just what we put into it!

DR. FINNEY: Gentlemen, the chair really does not feel like calling for any further remarks. There is just one thing that I wish to say. The last speaker referred to a number of classes of men, but overlooked one class, and that is the great big man in the profession who needs looking after, too. (Applause and laughter.) He is not going to be forgotten.

DR. G. STERLING RYERSON, Toronto: It was with a great deal of pleasure that I received the invitation to attend this great meeting of the surgeons of the United States in the capital of this great Republic, and I came here very readily because of my interest in surgery and because of my feeling of sympathy and regard for the people of the United States. I felt it a great honor as a Canadian and as a British subject to be permitted to enter your College as one of your Fellows. Let me remind you that there is another great College of Surgeons, the College of Surgeons of England. And let me remind you of the beginning of that college. Two hundred and fifty years ago the College of Surgeons, or the barber surgeons of England, were a very insignificant and a very weak and powerless people. But there were among them wise men, men of science, men of ability, who saw farther than the day in which they lived and who founded the great College of Surgeons of England. Other times make other practices. They began in one way; you are beginning in another. They began in a very humble way, rising, rising from the depths into the leading college of surgeons of the world. You are rapidly born. You actually exist as a great profession, but you are trying to be something better still and organize this College as a great power, as a great element to assist the profession of surgery. So you are doing something that is not only going to redound to your credit, but to the credit of the United States. And let me say with all sincerity that I believe the time will come when the center of medical education and medical science will be on the continent of America. I am not flattering you, you know; but I believe that to be the truth. Let me tell you a story—speaking of flattery—to illustrate what I mean. On one occasion Lord Beaconsfield was at Windsor Castle and he was asked by the Queen what he considered the two greatest books in the world. And he said, "Madam, I consider the two greatest books in the world the Bible and your 'Diary of My Life in the Highlands.'" He was asked by the courtiers afterwards why he said that, and he replied, "When I flatter royalty I lay it on with a trowel." I am not "laying it on with a trowel" here. I want this to be a great institution, and you have power, by your great moral influence, to build up a great college; and you have also the great College of Surgeons of England as an example. But you are going to do something more. You are going to add to the surgical research. You are going to do something with regard to reference libraries, with regard to being able to consult the most skilful works and libraries, and that requires money, and that is why you are called here to-day. I do not believe you could do better than you have planned, because your benefits will be great, very great; but the greatest of all benefits to be considered is an unselfish benefit to the patient. Every medical man whose faith is grounded upon the ethics of our great profession has but one view: the great benefit to be secured for the patient. Whether his own personal interests are served or not, that is his one object. And that is one reason for supporting this institution. You are going to do yourself and your patient an enormous benefit. I believe this College will have great success, and that its members will grace it with their ability and with their loyal and conscientious support.

DR. FINNEY: We do not want any one to be slighted. I hope that any one who has not received a card will ask for one before he goes out. It is important in order to make the plan effective that a substantial part of the amount should be pledged at this time, giving reasonable assurance that the entire amount will be subscribed within the year. It is therefore necessary that the gentlemen will add their names to these cards. Those who contemplate doing so, and I trust you all will, for the good of the cause, do so to-day, so that we will know where we stand. There is a lot to be done in the next year, and it is a big amount of money to raise, but we need it and we are going to get it. (Applause.)

Gentlemen, before we adjourn, there is one other thing: I am going to ask you now to meet by states in order that you may nominate a list of men from whom the Board of Regents can select the Chairmen for the new Credentials Committees. Remember that we are now standing, not with unwilling feet, I trust, where the brook and river meet. Back of us is the old organization; in front of us is the new plan, the real work. Now we have new committees —new Credentials Committees—and in order to make this as democratic as possible, to free it from the charge of centralization or whatever else you choose to call it, we want you to meet and give us a list of names from which we can select the Chairmen of the State Credentials Committees. Now, then, every Fellow has three votes. He can vote those three for one man if he wants, or he can vote them for three men. From that list of names one will be selected from the three highest—not necessarily the highest, but from the three highest—by the Board of Regents, to be the Chairman of the new committee.

DR. FINNEY later rapped for order and made the following announcement: I wish to make another announcement, and that is that this $500 may be paid in annual installments if preferred. That this $500 is for life membership and from it will be deducted the Fellowship dues of $25.00 and all annual dues that may have been advanced at the time the first installment upon the subscription is paid.

THE HIGHER EDUCATION IN SURGERY

FELLOWSHIP ADDRESS

BY EDWARD H. BRADFORD, M.D., F.A.C.S., BOSTON

THE American College of Surgeons has shown such remarkable vigor in its development that there is every reason to believe that it will become a most important agency in the advancement of American Surgery. It may therefore be proper to call to your attention a few suggestions for the consideration of this organization relating to better education and training of our surgeons.

It has been said by those who undertake to study the American people that the typical American, although energetic, resourceful, and venturesome, lacks a knowledge of fundamentals. He has the defects as well as the virtues of the pioneer. Are these traits characteristic of the American surgeon? If they are, the fact should be reckoned with in our plans for the training and education of our surgeons. We should foster the energy of the pioneer and give to him the fundamental knowledge needed by a master.

In the early days the aspirant in surgery became the student of the nearest active practitioner to whom he could attach himself. He was an articled assistant. After a while he ventured upon practice alone, and in the rough school of experience, competition, and emergency, he developed force. Later, groups of forceful men associated themselves together and formed proprietary schools, and the country was filled with energetic aspirants in surgery.

There are advantages in this system of education in a large, new, and unsettled country — the training fits the locality. It does not, however, tend to develop thoroughness or scholarship.

The European method of educating surgeons was to collect students in the large cities, where they were taught by learned men the fundamentals of knowledge in medicine and surgery. They learned anatomy and were stimulated by watching the great surgeons at work in their hospitals. Besides learning the essential principles they acquired high standards.

The product of the American system of educating surgeons has been excellent. There have been developed some remarkable men and as alert and resourceful a body of skilled surgeons as can be found in any country. But can we claim to have produced many of those who have done most to influence the surgical thought of the world? We developed Ephraim McDowell, but we have yet to produce a Lister.

In this connection it is interesting to reflect upon how much more America, a professedly peaceful country, has done to revolutionize the science and art of war than the humane art of surgery. The advance in open order, field entrenchment for the attacking army, the use of cavalry in long raids on the enemy's lines and as mounted infantry, improved implements of war, the rifle, the automatic pistol, the Hotchkiss gun, and in

naval warfare, the ironclad, lateral shell firing, the torpedo, the mine, the submarine — all are products of American invention, or first shown to be of value by American example. The field telegraph, the heliograph, the telephone, and the American invention, the flying machine, have revolutionized war. During the same period surgery has been revolutionzied, but how much can we justly claim that America has contributed to the marvelous changes wrought in the last fifty years?

There is another criticism of our present surgery, applicable to all modern surgery, but perhaps more so to this country as it is especially exemplified in our surgery. It is claimed that surgery to-day is overdone; that as in the past there was polypharmacy, to-day there is polysurgery, and that there is danger of needless, heedless operating. Are there just grounds for this accusation?

If we can imagine the great masters of surgery of the last century looking down upon a modern surgical amphitheatre, can we not fancy that they would be filled with astonishment, perhaps also with horror. Horror in the thought of the many lives sacrificed in former times through the ignorance of the simple laws of asepsis, but also horror perhaps at the number of operations done now, where Nature, if given a fair opportunity, could cure and perhaps cure more satisfactorily.

If the surgeon in the past, more than his modern successor, killed in his operations, he maimed less. Afraid of a possible fatal result he operated only to save life — never to determine the nature of the disease; exploratory operations were unknown. To-day an operation is too often undertaken on a chance of benefit; subsequent operations follow to relieve the scar tissue caused by the first operation, which, unsuccessful in furnishing relief, was thought successful in that the patient did not die but lived with symptoms somewhat relieved by changed environment.

Do not modern conditions favor the development of surgery of this type rather than the training of the surgeon who knows when not to operate? It is unquestionably the function of this organization to promote the development of surgeons who are not simply hands for such general practitioners as, unable to make a diagnosis or direct further treatment, turn for help to their more venturesome colleagues. There should be surgeons of broad minds thoroughly familiar with methods of diagnosis and capable of forming a judicial opinion as to the relative value of both operative and non-operative treatment.

Surgery in its lower grades may be a specialty requiring chiefly the skill of trained hands, but the master surgeon covers the whole field of the art of healing. The corps commander to-day must be trained as an engineer, but if he is only that he will never prove himself a great commander.

Fortunately for our profession and for the community there exist influences which can check the narrowing and debasing influences which hinder the full development of the science of surgery among us. Schools, hospitals, research institutions, surgical societies, universities, and an organization such as this American College of Surgeons can aid powerfully

in promoting the elevation of the noble art of surgery to a higher plane than it has ever attained before.

Our medical schools to-day have, thanks to the energy of our medical profession and the influence of the American Medical Association, been brought to a standard state of efficiency, and no medical student can become a practitioner who has not received a proper knowledge of the fundamental sciences. When he reaches the stage of practice, he should know how to use his knowledge on lines of trained reasoning, or appreciate the arguments of those who do.

If the graduate desires to practice surgery, he should be trained as a dresser and should, after finishing his medical education, have opportunities for technical training in surgery by service in hospitals that need properly qualified assistants in surgery and residents.

The hospital should do more than give positions to young men who help in the surgical work of the hospital; they should arrange for their careful training in surgery.

Endowed hospitals to-day should not be content to care merely for the sick in their wards; they should aid in the combat with disease. There should be connected with every hospital, not only nursing and operating facilities, but also agencies for determining the ultimate results of operative procedures. The hospital should be a clinical laboratory for the acquisition of knowledge relating to the surgical care of those surgically afflicted. A proper valuation of surgical methods is essential, and for this terminal results must be tabulated. This can only be done by efficient organization; it cannot be properly done by the desultory efforts of a few energetic surgeons.

Research and animal experimentation are aids; but experiment being impossible in the human animal, sound generalization is only possible when based upon a large number of carefully recorded cases collected in large hospitals and studied by a number of trained observers. This is the proper work of hospitals, and they should be rated according to their efficiency in such work.

From hospital residency the young surgeon can develop further as a junior associate to a broad master in surgery, who should encourage such association and should promote individual effort and independent thinking of the properly trained who seek to advance themselves to mastership by thorough preparation and carefully considered experience.

Much work by an association like this is needed to promote a proper knowledge in the community of the need of coöperation of hospitals in the work of the development and education of surgeons. It is not only in the arrangement for dressers and residents that this is needed, but also in a suitable arrangement of the services of attending surgeons, that it may be possible to utilize the experience gained for the benefit of the science of surgery. Short services, interrupted services, services so arranged that generalization in regard to methods is difficult, if not impossible, are too frequently provided for in hospital organization. The surgeon spends his

energies centering his attention upon individual cases, presenting few surgical problems, and is unable to devote his time to the larger problems of the treatment of disease in general. The younger surgeon may be perfectly competent to take care of the individual case, but the surgeon of experience with various methods should be given an opportunity to direct the treatment and to determine the value of improved methods. In many cases this causes disarrangement of existing hospital services, but where the authorities are aware of the need of such changes they can be brought about to the benefit of surgical science.

The road to the leadership in surgery is a long one. If "art is long," surgery is longer. It may take but little time to teach a man to play the violin, but for a virtuoso — a Kreisler — years are needed, but how much more is required to develop a Mayo, a Kocher!

How much can our societies aid in the better education of surgeons?

The only real education is self-education. This is helped by opportunities of comparison with others; the discussions of colleagues reveal individual strength and weakness.

Surgical societies should be organized so as to promote the careful study of surgical problems, the value of methods, a proper standardization of treatment, and should discourage the exploitation of individual success. Little benefit could come from a meeting of Jack Horners, though a discussion among them might furnish entertainment. Cöoperative work among surgical societies would be of great value in the direction of study, the promotion of interest, and in the elevation of standards.

A more difficult matter suggests itself in the question of the bestowal of proper degrees and titles. The public has become trained with more or less accuracy to distinguish between the incompetent and proficient in music. Would it not be well if there could be some accepted standards of recognition of the trained and judicious in surgery, as compared with those whose qualities are chiefly energy and boldness, driving foward an untrained mind—who are, in short, surgical adventurers? Masterly skill in surgery is not a quality easily recognized by the public. The death rate was formerly a check to the injudicious surgeon; to-day, thanks to asepsis, there should be no death rate, and it is hard to follow the trail of failure among the convalescents who rejoice in a recovery from what has seemed to them the jaws of death, nursing their impaired activities with satisfaction in the thought of what might have been and what they think they have escaped from.

Could it not be a function of the American College of Surgeons to aid in a movement to standardize surgeons? There are apprentices, journeymen, craftsmen, masters, and past masters in the arts. Could we not help the community if we were to grade and rate surgeons as assistants in surgery, i.e., medical graduates, bachelors in surgery, masters in surgery, doctors in surgery? Should there not be a high degree of honor for great surgeons comparable to that awarded to statesmen or lawyers in the Doctor of Laws?

American surgery will be advanced if there are developed in this large

country of ours several foci where the art of surgery is practiced and taught in the highest degree of excellence. It is a great satisfaction to the observer to see, already, centers developed where the work is worthy of the careful consideration of the leading surgeons of the world. An increase in the number of these places where the science of surgery is investigated and the art of surgery efficiently practiced cannot fail to produce results which will, in time, claim leadership in surgical thought.

A few words only are needed in regard to the question of what may be termed surgical ethics, a subject which cannot be ignored by an association like the American College of Surgeons, which is to maintain the standards of our profession.

If it is borne in mind the great opportunity which exists for the gross misuse of the power the surgeon holds it might seem extraordinary that so little of gross commercialism or base malpractice exists. The surgeon at the head of a small private hospital has power greater than that of a czar. Under an organization trained by himself, with no one but his attendants to criticise his activities, he wields a power controlled only by his conscience and his higher instincts. It may be said that in the process of his education and in contact with his fellowmen no one can rise to eminence in surgery without an education which elevates him from the baser temptations which are more potent in other callings. It certainly is true that in this commercial age medicine and surgery are less commercialized than any of the other large human activities. Michiavelli, the great thinker of the period of the Renaissance, held up the standard of the ideal prince whose craft and deceit were regarded as the proper functions of the ruler and statesman, but we have no evidence that the surgeons of that time were other than truthful and honest.

To-day the philosophy of the superman, that might makes right, will never find acceptance in our profession. As the soldier must have courage, and the priest and clergyman purity, the surgeon must be human.

It cannot, however, be ignored that the danger of lowering the standards among young and ambitious surgeons, eager for the renown and emolument of a large practice, is something which must be considered by an organization like the American College of Surgeons. There can be no compromise in this matter. Any one practicing the art and science of surgery who is unmindful of the high responsibilities and duties of his profession should receive immediately the condemnation of his fellows. The true surgeon should be, like Caesar's wife, "above suspicion"; he must be above reproach.

It can be said that the occasion is ripe for the higher development of surgery in America. How long the present Balkanization of Europe is to continue, and how much chaos is to result, no one can tell, but it is certain that the Mexicanization of North America will stop at the Rio Grande. If we have peace, we have also the responsibilities which come with the blessings of peace, and these are to be regarded as held by us in trust for the benefit of the human race.

It is worthy of notice that at the present time when we are in the confusion and welter of war and in the upheaval of traditions, when the foundations of our civilization seem to be shaken, when new philosophies arise to confuse the question of right and wrong, when the power of strength seems to overthrow the sense of the brotherhood of man, when art is trampled upon and force enthroned, when laws and treaties are disregarded, that the one profession whose value is unquestioned is that of the surgeon. Never was there a time when our art commanded greater respect or deserved it more than at present. It is, therefore, unquestioned that the development of this noble branch of the great science of medicine is a work which deserves the earnest effort of all associations organized for the help of human kind.

It is not simply in the carrying trade or as bankers that we should aspire to leadership. Primacy in the noblest and most humane science and art comes to us now as a duty.

Modern surgery may be said to have begun in France over a hundred years ago through the leadership of a brilliant group of surgeons, who were followed by an illustrious school of British surgeons. Then came the wonderful rise of German surgery to which we are all such debtors. Are we to remain followers, provincials, notable chiefly for our ability to adopt the example and teaching of others?

In the literature of our art there are names before which we all do reverence—Dupuytren, Larry, Nelaton, Brodie, Paget, Lister, von Langenbeck, Billroth, Volkmann. They were thought-compelling masters who shaped the surgical science of a century.

What names are to be written now upon the open book of the history of surgery? Is there not a page ready for the names of great Americans who will give to the noble art of surgery a luster never known before?

It is the proud function of the American College of Surgeons to aid in the advancement of the higher education in surgery. The American surgeon will never lack skill, energy, nor resourcefulness; to these must be added wisdom.